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How One Steel Plant Purifies Its Boiler Water

The System Installed by the Brier Hill Steel Co., With Details of Its Construction and Method of Operation

The progressive manufacturer constantly is striving to reduce his cost of production, and in no line is this more apparent than in the iron and steel industry. Some manufacturers have confined their efforts almost entirely to the production of their finished product, overlooking many important items of expense, such as boiler maintenance, or, in other words, the cost of steam generation. The more progressive iron and steel producers have taken up this phase as they fully realize that it costs money to make steam from scaled boilers, not only for the additional fuel, but for boiler cleaning and repairs.

This subject was given considerable consideration by the Brier Hill Steel Co. in the building of its new steel plant at Youngstown. Its available source of water supply is the Mahoning river, which contains variable amounts of suspended matter and scale-forming substances, the incrusting solids varying from 8 to 20 grains per United States gallon, depending upon the season of the year, or more properly upon the amount of rainfall.

To use water of this kind would entail enormous expense for boiler maintenance, which would undoubtedly affect adversely the cost of the finished product from this mill.

To overcome this waste and expense a 1,000,000-gallon per 24 hours water softening and purifying system, manufactured by the Wm. B. Scaife & Sons Co., Pittsburgh, has been installed. This installation is illustrated in Figs. 1 and 2.

The system consists essentially of three reaction and settling tanks, each equipped with mechanical stirring device, operated by a small electric motor, a reagent mixing tank with mechanical stirring device and steam jet pump for introducing the reagents into the reaction and settling tanks and two mechanical gravity filters.

The treating tanks are filled as soon as they are empty with the water to be purified, which is taken from the condenser hot well, and while a tank is filling, the prescribed reagents are introduced and thoroughly mixed with the water by means of the mechanical stirring devices. The mechanical stirring device consists of a specially designed, power-driven revolving paddle. The paddle not only mixes the reagents with the water, but at the same time stirs up from the bottom of the tank the sludge of previous purification.

The sludge floats in the water, hastening the chemical reaction and

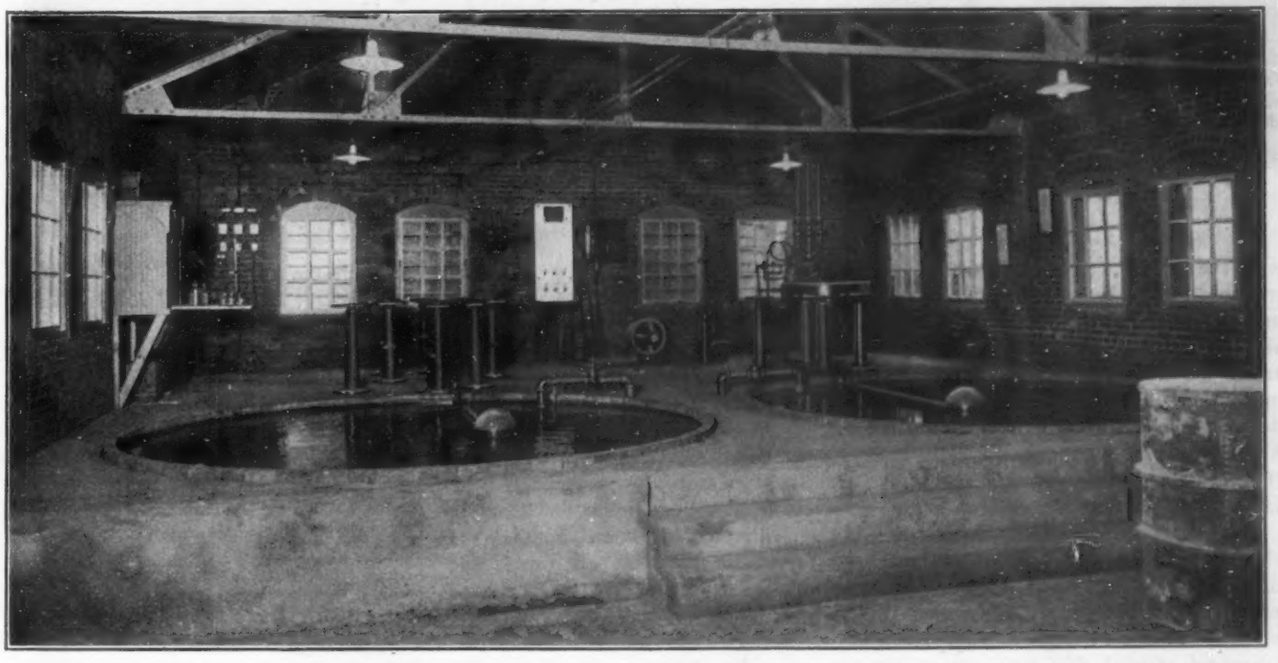


FIG. 1—INTERIOR OF OPERATING HOUSE AND CHEMICAL STORAGE OF WATER SOFTENING AND PURIFYING SYSTEM INSTALLED BY THE BRIER HILL STEEL CO., YOUNGSTOWN, O.

causes the finely divided precipitate to form large flakes heavy enough to settle as soon as the water stops moving. The stirring devices are thrown in and out of service as required, by means of levers, operated from the operating house.

After a tank is filled, the stirring device is stopped, and the water permitted to stand to allow the precipitate to settle to the bottom of the tank. The softened water is taken out of the tank by a hinged floating outlet pipe, arranged to rise and fall with the level of the water, so that the water always is drawn from the top, where it is the clearest, and the least amount of floating sludge passes through the floating outlet pipe to the filter. The filters are washed with the settled water from one of the treating tanks, by reversing the flow in the filter, with the assistance of air supplied under pressure from a small blower operated by the same motor used for operating the stirring devices. The rate of flow to the filters is controlled automatically so that they are supplied with water as fast as it is drawn from them.

The water from the filters discharges into a clear well, the rate of flow from the filters to the clear well being automatically controlled to prevent the filters from being drained when an unusual demand occurs, and under regular conditions, keep the clear well full. The clear well is located between the wells which support the treating tanks, giving a storage of treated water of approximately 50,000 gallons. This insures a constant supply of accurately-treated, soft, clear water and regardless how serious an accident may occur, two reaction and settling tanks full of water, as well as the water in the clear well are available. This is ample for several hours' operation and allows time for repairing any breakage that might occur.

Pipe connections through which the tanks are filled and the sludge washed out, are placed in the bottom. To remove the sludge from the settling tanks, a valve is opened to the sewer, the stirring devices are started and the stirred mixture flows through the pipe into the sewer.

Some of the special features of this system are the following:

Float-operated electric bells notify the operator when a treating tank is full or empty.

The height of the water in the treating tanks is always indicated by mercury gages mounted on a white enameled iron gage board, so that the operator can note, at all times, the amount of water in the reaction and settling tanks.

A particularly novel construction was employed in connection with valves used for operating this system, all of which are below the operating floor. A standard pattern outside screw rising stem valve was used with extension stem and stand. In place of the hand wheel, a collar was fastened to the valve nut and this collar was attached to a pipe extending through the valve stand to which the valve wheel was attached. A rod inside the pipe, resting on the valve spindle and extending above the valve wheel, moving up and down with the opening and closing of the valve, indicates the exact opening of the valve. On each valve stand is mounted a brass plate giving the name of the line in which the valve is located.

The results obtained from this apparatus are best shown by the following analyses; analysis "A" represents the ingredients of the raw water, which might be taken as a fair average of Mahoning river water, at an average stage. Analysis "B" is this same water after treatment:

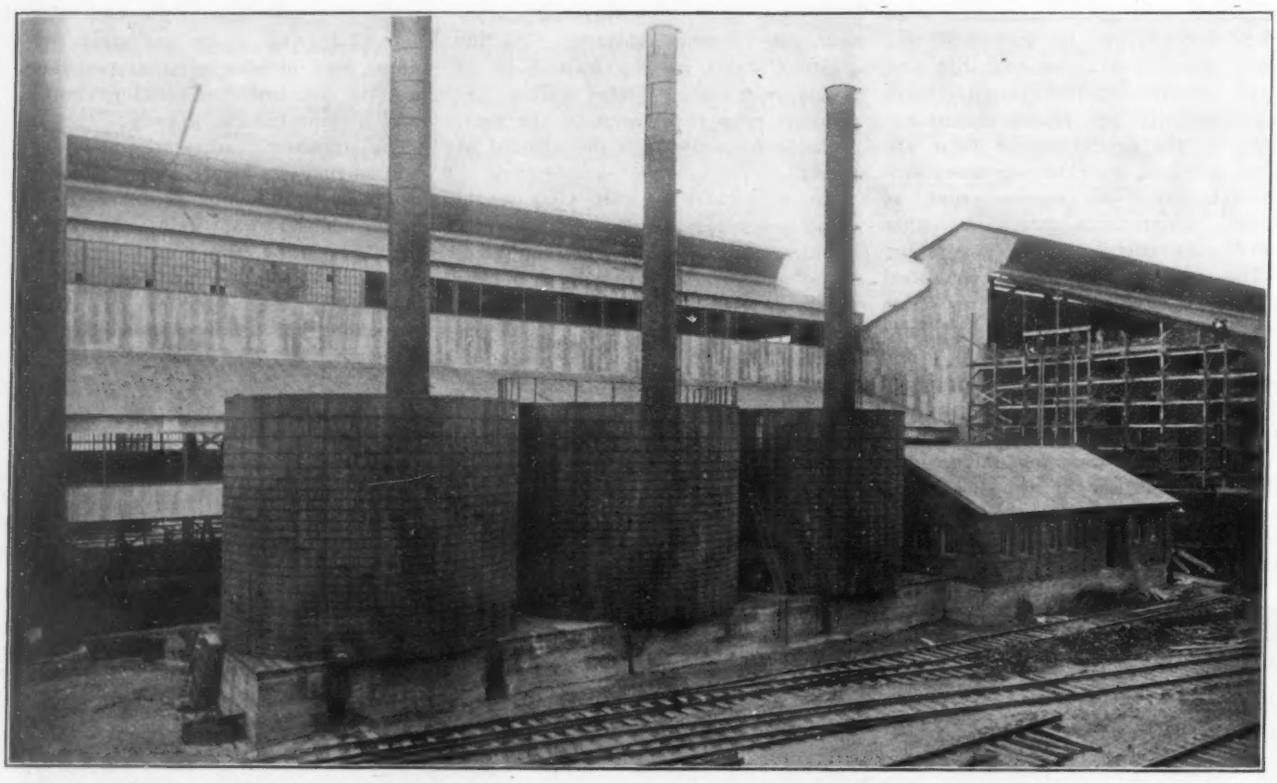


FIG. 2—EXTERIOR VIEW OF WATER SOFTENING AND PURIFYING SYSTEM, SHOWING THE TANKS AND OPERATING HOUSE

Analysis "A"

	Grains per U. S. gallon.
Volatile and organic matter	1.15
Silica	0.30
Iron and aluminum oxides	trace
Calcium carbonate	4.50
Calcium sulphate	7.14
Magnesium sulphate	5.19
Sodium sulphate	1.31
Sodium chloride	3.46
Sodium nitrate	0.16
Total solids	23.21
Suspended matter	0.25
Free carbonic acid	0.22
Incrusting solids	17.13
Non-incrusting solids	4.93

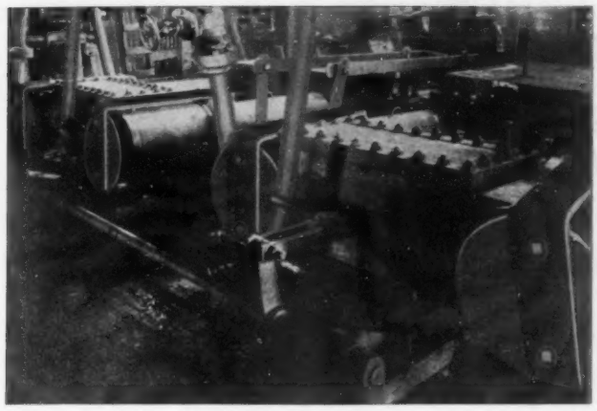


FIG. 1—ONE FORM OF CYLINDER HEAD GUARD

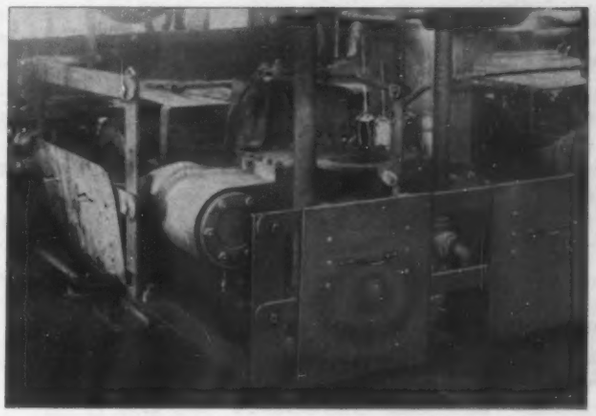


FIG. 2—ANOTHER FORM OF CYLINDER HEAD GUARD

Analysis "B"

Volatile and organic matter	0.55
Silica	0.45
Iron and aluminum oxides	trace
Calcium carbonate	1.50
Magnesium hydrate	0.23
Sodium carbonate	0.53
Sodium sulphate	17.25
Sodium chloride	3.30
Sodium hydrate	0.88
Total solids	24.69
Suspended matter	trace
Free carbonic acid	none
Incrusting solids	2.18
Non-incrusting solids	21.96

The treated water is clear, free from oil, the incrusting solids have been reduced to about two grains per U. S. gallon; it contains no sulphate, chloride or nitrate of lime and magnesia.

Guards on Roll Train Engines

In spite of the growing use of electric power in rolling mills, steam engines are still employed in many plants for driving the roller tables.

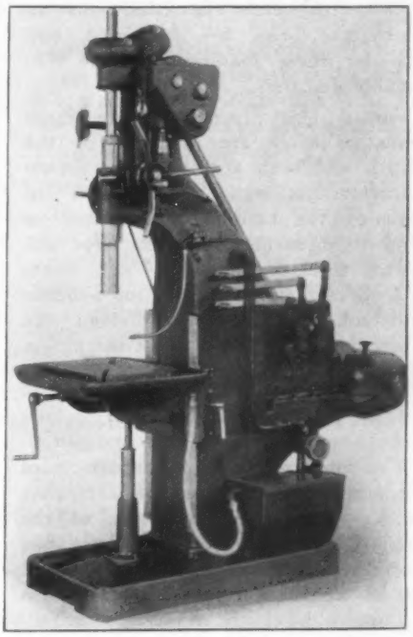
At the Joliet works of the Illinois Steel Co. it was discovered that accidents might occur from the cylinder heads of these little engines blowing out. In order to prevent the broken pieces from flying and doing possible injury, heavy steel guards, shown in the accompanying illustrations, were placed over the cylinders. In one case the guards are bolted individually to each cylinder. In another place they are fastened to the floor and provided with removable shields which permit access to the piping.

An eight-page bulletin describing a power counter for use on engines, pumps, compressors, etc., manufactured by H. Maihak Aktiengesellschaft, Hamburg, Germany, is being sent to the trade by Herman Bacharach, 1009 Hartje building, Pittsburgh. This device determines the mean horsepower of reciprocating engines over any desired period of time, taking into account every diagram developed.

A Self-Oiled, All-Geared Drill

An all-geared, 22-inch, self-oiled drilling machine, designed for heavy duty work and rapid production, built by the Barnes Drill Co., Rockford, Ill., is shown in the accompanying illustration. The machine has eight changes of geared speeds and 10 changes of geared feed, which are under the control of the operator from the front of the machine.

All transmission gears, aside from the friction clutch gears, and including the crown gear and pinion, are cut from high grade steel and are subsequently heat-treated to reduce wear and to increase strength. The



BARNES 22-INCH ALL-GEARED DRILL

eight changes in speed are effected by levers within reach of the operator and the spindle may be stopped by placing the shifter lever on neutral position or by throwing out the clutch gear. The 10 changes of geared feeds are controlled by levers, the feeds being indicated on the index dial plate. All bearings, aside from the spindle sleeve and cross spindles, are lubricated automatically. A geared pump in the reservoir of the machine distributes the oil to all gears and bearings, including the crown gears and feed box. This machine has a capacity for operating high speed twist drills from ½ to 2 inches; the overall height is 85 inches and the distance from the center of the spindle to the face of column is 11 inches. Other dimensions follow: Spindle travel, 14 inches; size of table, working surface, 20 x 14 inches; vertical travel of table, 23 inches and speed of driving pulley, 500 revolutions per minute.

Indiana in 1912 produced minerals to the value of $42,239,193, an increase of nearly $5,000,000 compared with $37,430,187, the production of 1911. The 1912 figures, however, do not include the value of the pig iron produced in the state, which was more than $17,000,000. The principal products of the state are coal, clay, cement and stone, these having a value of 90 per cent of the total output. In 1912 Indiana was the third largest coke-producing state, the output having increased from a little over 900,000 short tons, valued at $3,600,000 in 1911, to 2,616,339 short tons, valued at $12,528,685 in 1912.

The number of anthracite coal mines in Pennsylvania in 1912 was 275, according to E. W. Parker, of the United States Geological Survey, and the average output of each was 289,456 short tons. The number of bituminous mines was 5,747, and their average production 78,184 tons. The average production from each anthracite mine is therefore nearly four times that from the bituminous mines.

Refractories in the Iron and Steel Industry[1]

The Use and Development of Fire Clay, Silica and Magnesite Brick for Lining Furnaces Employed in Metallurgical Work

By Henry W. Croft[2]

The word *refractories* refers to the materials used to resist the action of heat, slags and gases continuously at work upon the lining of practically every furnace engaged in metallurgical operations. The briefest consideration shows their importance when we recall that the blast furnace and the hot blast stove are merely huge stacks of fire brick enclosed in steel shells. The open-hearth is a structure of various refractories properly stayed. In such furnaces the refractories form the laboratories where heat, slags and gases may effect their transformations.

In considering refractories we divide them into three classes, the quantities of each manufactured in 1912, according to the United States government statistics, being as follows: Fire clay brick, 778,000,000, or 83.8 per cent of the total; silica brick, 136,000,000, or 14.7 per cent of the total, and basic or magnesite and chrome brick, 14,000,000, or 1.5 per cent of the total.

Fire Clays

Fire clays are essentially silicates of alumina, varying widely in their proportions of silica and alumina and in the content of impurities, such as lime, iron, magnesia and alkalies. They are formed by the disintegration and decomposition of feldspathic rocks.

As the iron and steel industry requires a large percentage of high grade fire brick, and since the majority of these brick are made of the coal measure flint and plastic clays, we will, in discussing manufacture, confine ourselves to these two clays. Various mixtures are used, ranging from about 90 per cent of flint and 10 per cent of plastic in the most refractory brick, to a brick of the least refractoriness, made entirely of the plastic clay.

The clays mined and properly selected are broken into small lumps, mixed in suitable proportions and ground in the wet pan to the proper degree of fineness. The mass is then molded into shape, tempered, repressed, thoroughly dried on hot floors and burned at a temperature of 2,600 to 2,650 degrees Fahr. This is the old hand-made process.

This brick is open, porous and well adapted to withstand sudden changes of temperature. Many departures from this process have been tried and various machines employed in the different stages of manufacture. In many cases there has been a speedy return to the hand-made process, while in others a better brick has been developed for certain uses.

Machine-Made Brick

In the high grade brick the most noticeable development in the machine-made product is the manufacture of blast furnace brick by a steam or other powerful press. The machine-made brick is from 7 to 8 per cent denser than the hand-made one. Most cheaper grades of brick are made by machinery.

As to the uses and development of fire clay brick, we will consider definite examples, such as the blast furnace, open-hearth, etc., the conditions to which the brick are subjected, and how far these materials answer reasonable demands.

For a blast furnace lining three kinds of brick are made: For the hearth and bosh a brick of maximum refractoriness and one capable of resisting the action of the fused or semi-fused furnace contents; for the inwall a brick to stand high heats and abrasion; and for the top a dense and tough brick to withstand the wear of the stock and resist the action of the gases.

Brick for Water-Cooled Stacks

The introduction of the water-cooled furnace, with its lining of 12 inches or less, necessitated the use of the highest grade of refractories available, and the blast furnace operator and brick manufacturer co-operated in making a brick of more uniform dimensions and of much greater density than heretofore, without sacrifice of refractoriness. This was accomplished by a mixture of clays giving the minimum of shrinkage and by manipulation designed to increase their bond to the maximum. The brick were finally made into 12-inch blocks on a steam press. The result was a lining that fulfilled the expectations of all concerned.

The furnace in which this lining was put was blown out after an eight months' run to make some slight changes in the shell. The lining had taken on a thin coating of carbon, which, when chipped off, exposed the face of the brick, in many cases with the original skin intact. In making a 12-inch lining of such great density, backed by a water-cooled jacket, there was naturally some apprehension as to whether it would spall. An examination showed no spalling occurred. It also resisted the abrasion of the stock and channeling blast, and was practically impermeable to gases. A number of these linings have since been installed.

Committee Studies Subject

Several years ago a committee appointed by one of our largest iron and steel interests made an exhaustive study of refractories to combine practical operating experience with the knowledge of the brick maker in producing, if possible, better brick. The result of their study of blast furnace linings led to a specification for blast furnace brick calling for a minimum of impurities and of consequently higher refractoriness than the standard linings. To produce this brick without loss of bond, the carefully drawn specification called for special treatment in almost every department of the manufacture. Two hand-made linings were made under this specification.

In summarizing the three developments cited, it is of interest that each of the three efforts to improve the old standard lining approached the problem from a somewhat different angle.

The making of the steam-pressed linings for the thin-lined furnace aimed directly at a brick of much greater density and toughness without sacrificing refractoriness.

The second method undertook to materially increase the refractoriness of the brick, at the same time maintaining, if possible, the bond of the standard furnace brick.

The object of the third method was to increase both the refractoriness and toughness of the brick, in a lesser degree, possibly, than in the

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[1]Presented at the Chicago meeting of the American Iron and Steel Institute.

[2]President, Harbison-Walker Refractories Co., Pittsburgh.

other two cases, but without materially increasing the cost.

All three are refinements of manufacture with varying degrees of additional cost. As a furnace often runs four or five years on one lining, the determination of the qualities in a new lining is naturally slow, requiring a series of runs to cover the varying conditions under which different furnaces are operated.

At present blast furnace men are calling for the hand-made and machine-made linings in about equal numbers. The present machine-made lining includes as many as possible of the good points of the first steam-pressed lining referred to, without all of the extra treatment of clays and consequent higher cost. In one point apparently the machine-made brick should be superior, and that is in furnace tops. It is also possible to make it of more regular and uniform dimensions than by the hand-made process, which thus insures better bricklaying.

Hot Blast Stoves

In hot blast stoves fire brick act merely as a thermal reservoir, yet are subject to widely varying temperatures, to enormous loads, and in many cases to the fluxing action of the flue dust in unwashed gases. Again we note a development in the use of brick of greater density and higher refractoriness, with a decided tendency to substitute a higher for a lower grade brick. Another recent development is the use of silica brick in the flash walls and domes. This materially increased the life of the stoves.

Although in blast furnace and stove piping and connections high temperatures are not involved, mere density in the brick is insufficient; toughness is required. In recent years a high grade brick, specially designed for this use, has proved economical.

What has been said of stove brick applies to the checker brick, used in open-hearth furnaces and soaking pits. Here again the tendency is unquestionably toward the use of a higher grade brick.

The practice in many heating and welding furnaces is particularly severe on brick, for we encounter here extremely high heats and often sudden variations in temperature. Limited as we are by the refractoriness of the clays at our disposal, any substantial betterment in results must come from improved furnace design, or the substitution of silica for clay brick.

A remarkable development in the use of fire brick for boiler settings has taken place in recent years. It was but a few years ago that the words *boiler brick* were synonymous with a second or third grade material. Today no fire clay brick is considered too good if it materially lengthens the service.

For the side walls many are finding a blast furnace brick economical, and even expensive bauxite brick is sometimes used because of its greater resistance to clinkering. Under modern conditions of increased grate areas, mechanical stokers and forced draft, any or all of which may be involved in the common practice of working boilers from 50 to 150 per cent over rated capacity, the problem of the boiler setting is no small one.

At first sight the gas producer has no real lining problem, yet today certain producer manufacturers have entirely discontinued the use of other than the highest grade of brick, and are experimenting with various linings, including bauxite brick.

The silica brick, manufactured in Pennsylvania, are made from a quartzite that occurs in the Medina and Oneida sandstone formation. While extensive, these measures carry good rock only in limited, but well defined areas, the most familiar being the Mt. Union and Hollidaysburg districts. The Baraboo quartzite of Wisconsin, from which brick are made in the Chicago district, is of an older formation and is also found in limited areas. The rock from which silica brick are made in Alabama has not yet been distinctly located geologically. The deposits are comparatively small and widely scattered. The Alabama and Pennsylvania rocks are of a grayish color, while the Wisconsin rock is of a reddish appearance. Their analyses vary but little.

Silica Brick

In the manufacture of silica brick, care in the selection of rock is most important. At the quarry the rock is broken and at the works crushed into small pieces and ground to the proper fineness in the wet pan, 2 per cent of lime usually being added for bond. The brick are manufactured in a manner similar to that used in making clay brick, but are burned at a higher temperature.

The high refractoriness of this brick, its slight expansion under heat, and exceptional conductivity have increased its use enormously in the manufacture of iron and steel. In the open-hearth, whether basic or acid, its use is no longer restricted to the side walls, blocks and roof, but is extending to the checkers, roofs and walls of the regenerators.

The marked increase in the life of the open-hearth roof in recent years is noteworthy. Only a few years ago an average of 250 or 275 heats was considered fairly good. Today an average of 400 to 500 heats is not uncommon, and single runs up to 800 or 900 heats are frequent. While by far the larger share of the credit for this marked change is unquestionably due to improved furnace design, methods of operation and better bricklaying, we believe some credit is due to the improved quality of silica brick made today.

In the by-product coke oven is reflected the greatest development of recent years in the use of silica brick, displacing clay and quartzite brick completely above the oven floor and in certain portions underneath. It has developed surprising qualities in withstanding unavoidable changes in temperature and in meeting actual operating conditions. This use of silica brick is wholly an American development. A few years ago 24-hour coke was normal; today, by the use of silica with its greater refractoriness and conductivity, it is possible to make 15-hour coke. In eastern crucible practice silica has today displaced clay brick in fully 90 per cent of the tonnage.

Magnesite and Chrome Brick

The introduction of the open-hearth process for making steel called for a refractory material for lining the bottoms and sides of furnaces that would resist the action of basic slag. The oxide of magnesium, or magnesite, as it is called, was found best adapted for the purpose. Magnesite occurs in nature in two forms, the white or amorphous variety, and the crystalline. In its natural state magnesite contains from 48 to 52 per cent of carbonic acid gas, which must be driven off before the material is suitable for furnace work, and the difficulty of thoroughly calcining this white amorphous magnesite makes its use as a refractory impracticable. The crystalline form used by steelmakers is found in Austria, Hungary and Sweden. The crude magnesite is burned in shaft or rotary kilns, crushed, sorted and sacked, ready for furnace bottoms or to be made into brick. An approximate analysis follows: Magnesia, 82 to 88 per cent; lime, 2 to 4 per cent; silica, 3 to 5 per cent, and iron peroxide, 5 to 7 per cent.

A magnesite of this composition will flux sufficiently in a furnace to make a hard, vitreous bottom, or if burned into brick, will have a strong bond. The process of manufacturing magnesite brick differs but little from that employed in making other brick. The temperature of burning, however, is very high, approximating 3,000 degrees Fahr.

The major portion of magnesite and

magnesite brick used in the iron and steel industry is for the bottoms of basic open-hearth furnaces and in the side walls extending above the slag line. This material also is widely used in the ports and blocks, and many furnaces now are being constructed with the end walls and uptakes consisting of magnesite. The bottoms and side walls of electric furnaces of certain types also are of magnesite. Magnesite brick are being generally adopted in iron and steel furnaces wherever basic slag is encountered.

Chrome Ore

Chrome ore, or chromite, is coming into general use in steelmaking on account of its refractoriness and resistance to both acid and basic slags. It is a mineral that is practically neutral. It occurs widely distributed, being found in North America, Turkey, Greece, Japan, New Caledonia, Cuba and Africa. In practice, a chrome ore running from 40 to 50 per cent chromic oxide and from 3 to 7 or 8 per cent silica makes the best refractory. In the form of brick, this material is used in open-hearth furnaces, soaking pits and dolomite kilns.

Conclusions

In summarizing this review of the use and development of refractories there are certain points that bear emphasis, even at the expense of repetition.

We note the frequent use of magnesia and chrome brick to resist basic slags, displacing a high grade fire clay brick.

Silica brick is displacing clay brick where the maximum refractoriness is required and where the variations in temperatures permit.

A higher grade of fire clay brick is displacing one of lower quality.

In these, as well as other instances that might be cited, this tendency is apparent, namely, the gradual substitution of the higher grade refractories for the lower.

The number and variety of difficult shapes is fast increasing. Brickwork is laid with greater accuracy. Today less than half the clay or cement formerly used for laying is employed.

As in other lines of manufacture, specifications are becoming more rigid. Fire brick manufacturers are now working under specifications that several years ago were considered impossible.

The brickmaker is somewhat limited in his efforts to develop his product by the fact that in the past 25 years no new beds of fire clay of a quality better than formerly used have been discovered.

Electric Pyrometers With High Resistance

In the use of thermo-electric pyrometers, it has long been recognized as good practice to have the resistance of the millivoltmeter relatively high, but there have been difficulties in the way of producing such an instrument at a reasonable cost. For this reason, in the pyrometers generally used, the resistance has varied between 2 and 5 ohms. With this type

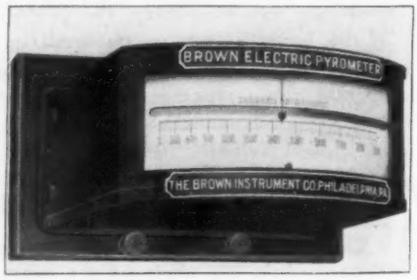


FIG. 1 — HIGH-RESISTANCE, THERMO-ELECTRIC PYROMETER OF THE INDUCTION TYPE

it is essential that the instrument be calibrated, together with the leads or connecting wires which are to be used, since any change in the length of these leads or of the thermocouple furnished will so alter the indicating that serious errors may result. A change in the length of leads of from 1 to only 50 feet is sufficient to make the average low-resistance pyrometer read 25 degrees or more low and a change in the length of the thermocouple from 3 feet to 4 feet will make the same instrument read 20 degrees more in error. For accurate results, therefore, it is necessary to use the thermocouple and leads which are furnished with the instrument, or

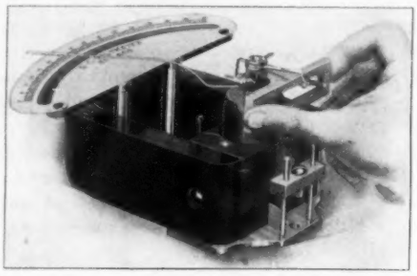


FIG. 2—INTERIOR CONSTRUCTION OF PYROMETER

exact duplicates, as long as a low-resistance millivoltmeter is employed.

For some time, high-resistance galvanometers or millivoltmeters, portable in form, but not of the switchboard or wall pattern, have been produced abroad. They are, however, usually of the type having the moving element suspended from the end of a fine wire or metal strip. The suspension strip also has another function, and that is to restore the moving coil to its zero position. This has to be comparatively long and also small in cross-section. It is also necessary, before using the instrument, to carefully level it.

The advantages to be gained from a properly designed and constructed voltmeter of high resistance are very marked and some of them are as follows: Any change in the length of leads connecting the thermocouple with the millivoltmeter from 1 to 1,000 feet will not vary the indications of the instrument as much as 5 degrees; nor is it affected by changes in the sizes of the several elements or alterations in the temperature of the leads.

All these advantages are due to the high ratio of the resistance of the millfvoltmeter to the resistance of the thermocouple and leads.

The Brown Instrument Co., Philadelphia, has for the past two years been conducting tests to enable it to design an accurate high-resistance, thermo-electric pyrometer. The result is an instrument of the pivoted type, in which the moving element or coil is not suspended from the end of a wire or metal strip, but is supported by means of small, hardened steel pivots in sapphire jewel bearings. The moving coil and pole pieces of the magnet have been so changed in design as to produce a magnetic flux of great intensity in the air gap in which the coil swings. This instrument has a resistance of 100 ohms.

In Fig. 1 is shown the standard type of indicating instrument of the high-resistance type, made horizontal so as to afford a long scale for easy reading.

Fig. 2 represents the interior construction of the high-resistance system, showing the redesigned pole pieces and small moving element, which has been lightened to a minimum.

The instrument can be used with base metal or platinum thermocouples, as desired. The same system is also used in connection with recording pyrometers.

Pennsylvania, Ohio, Illinois and West Virginia are credited with over 40 per cent of the total mineral production of the United States. Pennsylvania outranks all other states, producing nearly 25 per cent of the total, West Virginia comes second, Illinois third and Ohio fourth. California, with no standing as a producer of pig iron, iron ore, or coal, stands fifth in rank among the states, owing to its heavy production of gold and petroleum.

How the Fulton-Tosi Oil Engine is Constructed

Description of This New Diesel Type of Machine Which Will be Built for Two-Cycle and Four-Cycle Operation

A new line of Diesel type oil engines, built under designs and patents controlled by Franco Tosi, Legnano, Italy, is now being manufactured in this country by the Fulton Iron Works, St. Louis. This concern has been in business for about 50 years and has been prominently identified with the development of the Corliss engine. The Fulton-Tosi four-cycle oil engine is built in the vertical form with either two, three or four cylinders; the sizes range from 100-brake horsepower in two cylinders to 800-brake horsepower in four cylinders. The Fulton Iron Works also is preparing to market a line of two-cycle engines ranging in capacity from 800 to 3,000-brake horsepower. These will be similar to the four-cycle motors with the exception of such modifications as are necessary for two-cycle operation.

An oil injection pump of entirely new design has been provided and a vertical compressor, furnishing air for starting and other purposes is direct-connected to each unit. The engine is designed to operate on the cheapest crude petroleum, fuel oil or tar oil, and is so constructed that it may be started when cold within a minute. The fuel economy, it is claimed, ranges from 8 1/3 to 5 1/3 gallons per 100-brake horsepower-hour, the higher figure being at ¼ load and the lower at full load. These values are based on a fuel oil containing 18,500 B. T. U. per pound, weighing 7½ pounds per gallon, and are equivalent to a range in oil consumption of from 0.4 to 0.625 pounds per net brake-horsepower-hour. The cooling water required amounts to about four gallons per brake-horsepower-hour where the difference in temperature between inlet and outlet is 60 degrees Fahr.

The Oiling System

In accordance with the customary European practice, the Fulton-Tosi oil engine is provided with a positive circulating oiling system which delivers the lubricant continuously to the principal bearings. The oil escaping from the bearings is collected in a sump in the engine base, from which it is pumped through a filter into a reservoir and used over again. With this system of lubrication, there is said to be no accumulation of sulphuric acid in the crank case due to the slippage of gas past the piston rings.

The frame of the engine consists of a base plate to which is bolted an A-frame carrying the cylinder liner. The base plate is of box section heavily reinforced by transverse and longitudinal ribs. In order to obtain maximum rigidity, the axis of the shaft is brought as close as possible to the floor line. The main shaft bearings are babbitt carried in cast iron shells. They may be easily removed by slightly raising the crank shaft. The design of the A-frame is clearly shown in the accompanying illustrations. The distribution of metal is arranged with the view of obtaining a maximum resisting moment about the axes of the principal forces. In order to insure correct alignment, the frame is machined in a special tool which permits all boring and facing operations to be performed at one setting. A bracket cast integral with the upper end of the A-frame supports the cam shaft housing.

In accordance with a general scheme to make all parts of the engine which are subject to wear easily replaceable, the cylinder is made in the form of a liner cast from hard, close-grained iron. After being machined, the liner is fitted into the upper end of the A-frame from which it may be readily withdrawn. A suitable annular space is provided between the frame and the liner for cooling water. The liner is held rigidly only at the top end and therefore is free to expand and contract longitudinally. It is guided at the lower end and in the middle by heavy flanges inside the A-frame.

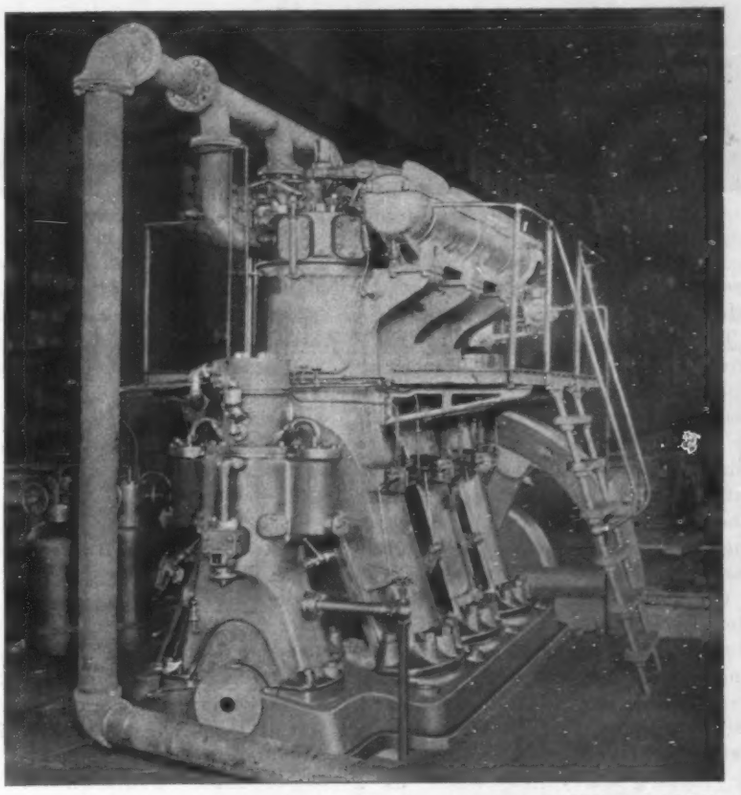


FIG. 1—A FULTON-TOSI OIL ENGINE ON THE TESTING BLOCK

The Valves

The admission and exhaust valves are placed in removable cages located vertically in the cylinder-head. The construction of the exhaust valve, which is water-cooled, is illustrated in Fig. 3. The valve stem is guided by a removable bronze bushing near

the lower end and by a spring cap at the upper end. The exhaust valve-head is cast iron shrunk on a steel stem. The admission valve-head and stem are forged in one piece. The valves are operated by rocker arms

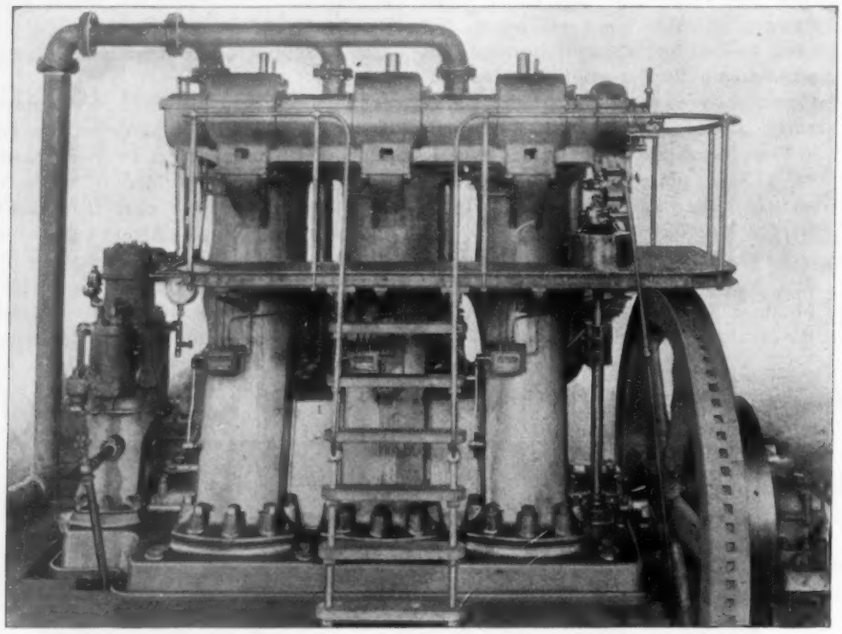


FIG. 2—SIDE VIEW OF THREE-CYLINDER ENGINE

so designed that they may be removed easily in order to get at the valve cages.

The valves are operated by cams fitted to a horizontal shaft extending along the top of the engine. This shaft is connected to the main shaft by a vertical shaft and two pairs of spiral gears. The gears mesh bronze with steel to insure quiet operation. The vertical shaft, which operates at engine speed, carries a Jahns governor of the through-shaft type.

The piston is of the trunk type and also performs the functions of a cross-head. There are six or more rings above the wrist pin. The larger size pistons are made in two pieces and the piston head is water-cooled. Telescopic pipes provided with metallic packing carry the water to a nozzle through which it is sprayed over the under surface of the piston head. This water is carried away promptly through return pipes and is not allowed to fill up the water space and add weight to the reciprocating parts. The connecting rod is machined from an open-hearth steel forging; the piston-pin end is slotted to receive an adjustable box lined with babbitt.

The fuel injection pump contains a rectangular chamber with walls made of comparatively thin steel plates. The elasticity of the walls is sufficient to compensate for differences in pressure on the oil due to the action of the governor. By-pass valves are obviated. The fuel injection valve is machined from nickel steel and is located in a vertical position in the exact center of the cylinder head. The injection valve is connected to its cam through a double system of levers which permits adjustment while the engine is running. The lead and length of opening of the fuel valve may be easily varied with the engine in operation so as to secure the most economical results at various loads.

The Compressor

A two or three-stage compressor which forms an integral part of the engine furnishes compressed air at from 700 to 950 pounds pressure for fuel injection and starting. The compressor is mounted on an extension of the engine base plate and is driven from a crank pin, the disc of which is bolted to the flanged end of the engine shaft. Provision for varying the lift of the admission valve of the low pressure cylinder and thus throttling the intake more or less, makes it possible to adjust the supply of high pressure air to the demands of the engine. This avoids waste in power resulting from blowing off of the excess volume of air through a relief valve on the high pressure line. All cooling water for the engine cylinders is compelled to first pass through the jackets of the injection compressor. This arrangement has several advantages, the most important one being that a cessation of flow is not only less liable to occur, but if it should occur, it is more readily noticeable by the operator than at the large cooling water discharge funnels on the engine proper.

Three seamless drawn steel bottles or air receivers are included to provide stored compressed air for starting purposes. The bottles float on the air line so that any dimunition in the pressure resulting from the withdrawal of air is quickly restored by the compressor, which has a capacity somewhat in excess of the operating requirements of the engine.

Each cylinder is provided with an air-operated starting valve. The valve is located vertically in a removable cage in the cylinder head. The use of air for the operation of the starting valves eliminates one cam and one valve lever from each cylinder.

The National Tube Co., Pittsburgh, has issued a bulletin devoted to air pump unions used largely on locomotive air lines. The subject is presented in the form of a conversation between a prospective user and a salesman. These unions are subjected to an air pressure test of 125 pounds before being shipped.

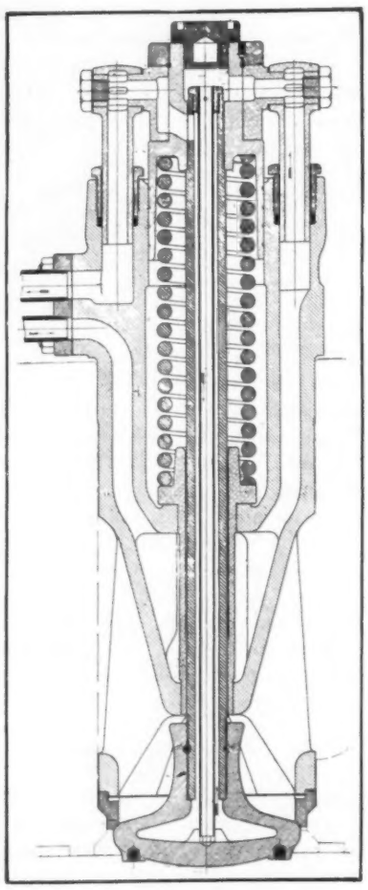


FIG. 3 — CROSS-SECTION OF WATER-COOLED EXHAUST VALVE

Use of Heat-Treated Gears in Machine Tools[1]

This Question Discussed From a Manufacturer's Viewpoint With Details of the Practice at the Gleason Works, Rochester, N. Y.

By Andrew C Gleason[2]

At the outset I wish to explain that the methods of heat treatment that will be described are those best suited to the requirements of the Gleason works; it is not claimed that they represent the general practice. In fact, it is rather hard to say what is the general practice, as the heat treatment of steel gears is largely a matter of individual requirements. Methods vary considerably even among manufacturers of a certain class of automobile gears which are of a standard shape and designed for one purpose, so that hardened gears for machine tools may well be considered a proposition distinct in itself.

Looking at this subject from the point of view of the machine tool builder, the principal questions to be considered are:

The advantages to be gained in the use of heat treated gears.

The selection of steel to suit the purpose for which the gears are intended, and the design to suit hardening conditions.

The methods of hardening and the necessary equipment and materials.

The cost of heat treated gears.

The advantages in the use of heat treated gears, properly made, are greatly increased strength and hard tooth surfaces which resist wear. These points certainly are of vital importance in modern machine tool design and it seems inevitable that hardened gears will soon be in general use in this class of machinery.

Soft Metal Gears

The failure of soft metal gears to stand the wear and tear in machine tools is too frequently the cause of breakdowns and in spite of the rapid development in design in other ways, such gears are still commonly used. They are a serious source of weakness and the logical remedy is heat treated gears.

Heat treated gears with their increased strength and ability to withstand wear, offer almost unlimited opportunity for compact design.

For an example of this, the automobile transmission suggests what can be accomplished with such gears in making machine tools more convenient in operation and more durable.

The question of steel depends not only upon the purpose for which the gears are intended, but also upon the design. When the gears are subjected to severe shock or heavy overload at times, a steel which will show the greatest tensile strength possible, without sacrificing toughness, is plainly the most desirable. But steel which will show these qualities has certain limitations for use in machine tool construction and it will be interesting to note the value of this—a straight tempering steel—as compared with

[1]Presented before the National Machine Tool Builders' Association.

[2]Gleason Works, Rochester, N. Y.

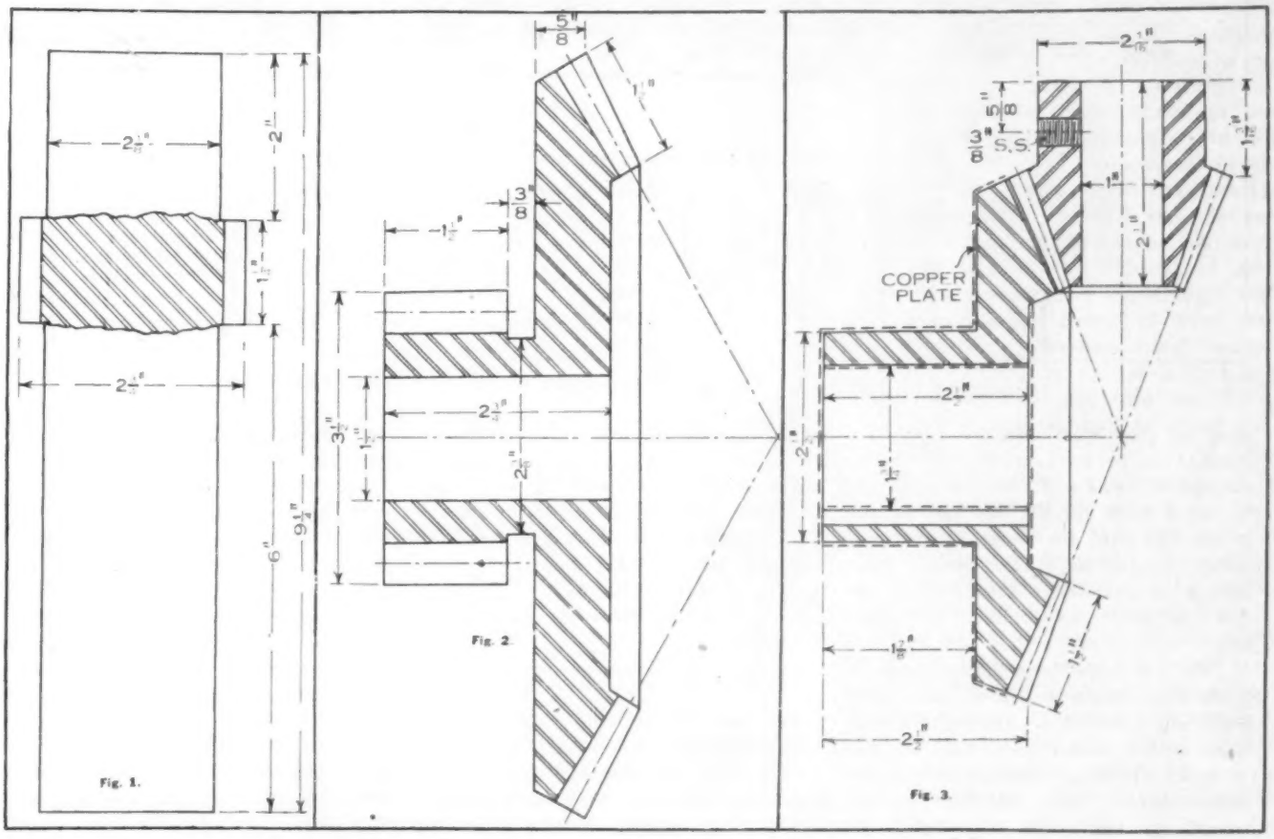


FIG. 1—PINION SOLID ON A SHAFT.

FIG. 2—SMALL PINION MADE SOLID WITH THE GEAR

FIG. 3—GEAR WITH LIGHT HUB PROJECTIONS

the more commonly used case-hardening steels.

Straight tempering steels for gears are invariably alloy stock and most of our experience has been with the chrome nickel alloy. With several different makes of stock of this kind, we have found an increased tensile strength after heat treatment of 150 per cent. The analysis varies considerably in different makes, requiring a corresponding difference in the heat treatment, but manufacturers making a specialty of alloy steels now furnish them carefully graded with instructions for hardening which can generally be relied upon.

There are frequent exceptions, however, to the rules for hardening any kind of gear steel and the only safe method is to experiment with every change in design. It is not sufficient to cut a piece off the bar and harden it regardless of the shape of the gear being made, as the sample piece should be practically the same as the gear in order to produce the same effect.

Take for example a pinion solid on a shaft as shown in Fig. 1. The teeth will chill much more quickly than the solid section under them and in order to avoid shrinkage strains on this account, special heat treatment is required to suit this shape and the quality of steel that is used. If a sample pinion of this size were made separate from the shaft, the effect of the same heat treatment would be radically different, owing to the fact that the center would cool almost as rapidly as the teeth.

Use Few Grades

Our experience leads us to recommend the use of as few grades of steel as possible. If the steel is selected to suit exactly each different shape of gear and the purpose for which it is intended, it would lead into a large variety in such varied requirements as the machine tool builder has. There are some steels which are more adaptable to different conditions in hardening than others and considering the comparatively small quantities and the variety of sizes and shapes in gears for machine tools, it is well to keep this in mind. Fool-proof methods in the heat treatment of gears are far from possible, but by the selection of a few grades of steel which show good average results, the work can be greatly simplified.

Chrome Nickel Tempering Steel

On account of the great strength and toughness of chrome nickel tempering steel and the fact that it hardens clear through, it is well adapted for automobile transmission gears and any similar purpose in the construction of machine tools. Gears of this kind do not chip on the edges of teeth and will stand almost unlimited hardship in sliding in and out of mesh.

Chrome nickel tempering steels tend to keep their shape in hardening better than the low carbon case-hardening steels, but they do warp some and they cannot be straightened without sacrificing the hardness almost entirely. Gears made of this stock do not show as hard a bearing on the surface of teeth as those made of case-hardened steel. The cost of machining alloy tempering steels will average at least twice as much as that of case-hardening steels, and the cost of the steel itself will run 14 to 16 cents per pound as compared to less than half of that price for high grade alloy case-hardening steels.

The chief advantage in the use of case-hardened gears is the file-hard tooth surfaces. The easy machining qualities and low cost of the stock are important advantages, also, but the superior wearing qualities make it the best at any price for average conditions in gears for machine tools.

In designing a machine tool from the ground up, there may often be occasion to make the gears as small as possible for the purpose, and it then becomes a close question as to the choice of tempered steel or alloy case-hardening steel.

The use of 5 per cent nickel low

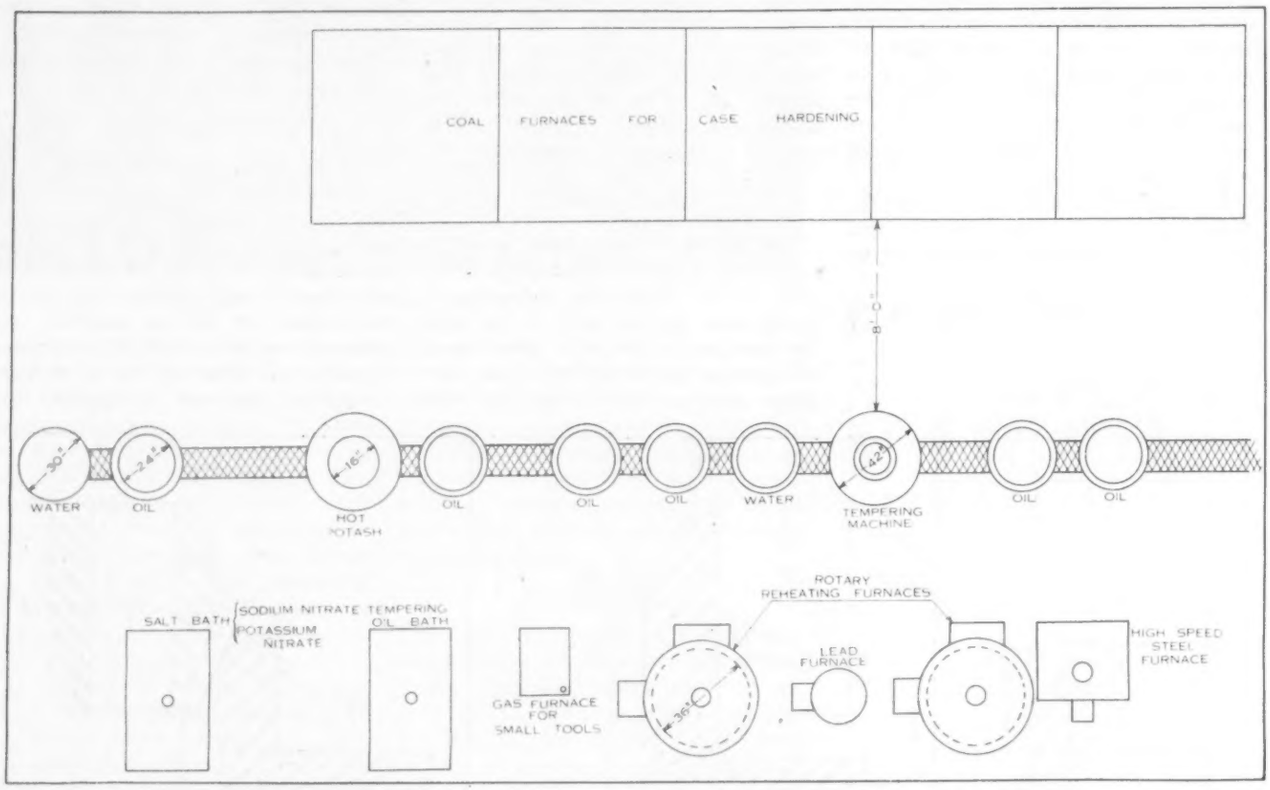


FIG. 4—ARRANGEMENT OF THE HEAT-TREATING ROOM OF THE GLEASON WORKS

carbon, case-hardening steel will give the best results possible—strength and wearing qualities considered—although if strength is the main issue, tempering steels, as previously explained, must be the choice.

Of the alloy case-hardening steels, we are more familiar with the three principal grades of nickel than any other. I believe that these have become, to a large degree, standard in the trade at the present time. These are 5 per cent open-hearth nickel alloy, 3½ per cent open-hearth nickel and 1-1½ per cent natural alloy.

The principal characteristics of these steels are a higher tensile strength than straight carbon steel to start with, and a correspondingly higher strength after case hardening. The carbon case has a close bond with the core and is less liable to chip than the ordinary machinery steel. In fact a number of manufacturers of the higher grade automobiles use the 5 per cent case-hardening steel in their change speed transmissions, where the argument might be claimed in favor of tempering steels.

When it comes to substituting case-hardened gears for soft steel or cast iron gears in machine tools, however, it generally will be found that a straight carbon, case-hardened steel will answer every requirement; as, unless the original gears have been considerably overloaded, the more expensive alloy steel gears would be an extravagance. In straight carbon steels for case hardening, we recommend 0.15 to 0.25 per cent carbon. A lower degree of carbon than this is quite apt to produce a laminated case which will crack or chip under heavy pressure. Nickel alloy steel for carbonizing should not run over carbon 0.20 per cent and 0.10 to 0.20 per cent carbon suits the best.

The nickel alloy has practically the same effect in hardening as an increase in carbon of about 10 points. We have found that 0.25 per cent carbon nickel alloy steel, case-hardened, generally will harden clear through very much the same as a straight tempering steel.

The teeth of soft steel gears in machine tools seldom break or strip until they have worn quite thin and our experience goes to show that durability is generally of more importance than excessive strength in gears of this kind. Case-hardened steels show an increased tensile strength ranging from 30 per cent in standard carbon steel to 75 per cent in high grade nickel alloy steel.

The straight carbon case-hardening steels do not run as uniform in analysis as the alloy steels and we cannot always get the same degree of hardness in the case as with the higher grade steels. This is particularly noticeable in gears of heavy section hardened in oil, but it rarely happens that the hardness will drop as low as that of tempering steels. A strong point in favor of case hardening steels for machine tool gears is that certain parts readily can be kept soft where it is found desirable for subsequent fitting. Hub projections, web surfaces, etc., can be copper-plated or enameled with various preparations so as to stop out the carbon in the carbonizing heat, leaving these parts perfectly soft for final machine operations, according to the usual practice in this class of work.

Present-day design of case-hardened gears for machine tools often makes it necessary to keep certain parts soft in order to avoid shrinkage strains in the hardening process. In a gear with light hub projections, as shown in Fig. 2, the carbon case would extend almost through the thin section of the hub at the keyseat and it is liable to crack on account of the uneven shrinkage in hardening. We advise making gears of even section throughout for hardening, but where it is necessary to use light hub projections like this, they can be made safe by this method of selective hardening.

In selective hardening, we have found that copper-plating the surfaces which are to be kept soft is the most satisfactory method. Generally, the parts to be plated can be immersed in the solution leaving the teeth clear, or the blank can be copper-plated all over so that when the teeth are cut, the bearing surfaces will be free to carbonize. It should be borne in mind that wherever this plated surface is marred, carbon will enter and leave a hard spot after the gears are hardened.

Other points for criticism in the design of the pair of gears, Fig. 2,

Table II.

Cost of Labor and Material For Small Lot of Mitre Gears.

Mitre gear, 18 teeth, 4 pitch, 1⅛-inch face, 1½-inch bore, ordinary hub.
11 pounds rough bar stock.
5½ pounds finished.
Our labor cost of machine work would be practically the same for this gear in any of the standard steels for carbonizing. The only difference in the cost complete would be in the stock. According to this, and taking the labor cost at $1 the gear complete in

Straight carbon steel at 3 cents would be	$1.44
One 1½ per cent natural alloy steel at 4½ cents	1.61
3½ per cent open hearth nickel steel at 6 cents	1.77
5 per cent open hearth nickel steel at 8 cents	1.99
Our labor cost of machine work of the gear in chrome nickel crucible tempering steel would be	2.00
Heat treatment	.09
11 pounds at 15 cents	1.65
	$3.74

Table I.

Cost of Heat Treating 1,000 Pounds of Gears in Chrome Nickel Tempering Steel

Labor, one working foreman and two assistants, wages	$ 9.85
Fuel oil, two hardening furnaces, 60 gallons	3.00
Quenching oil, 1½ gallons	.25
Tempering oil, 2 gallons	.50
Pyrometer ends	.10
Gas for drawing temper—1,500 feet	1.45
	$15.15

$15.15 ÷ 1,000 = $0.0152 per pound.

Cost of Heat Treating 1,000 Pounds of Case Hardened Gears.

Labor, one working foreman and two assistants, wages	$ 9.85
Coal, 3 furnaces, 200 pounds each	2.00
Carbonizing compound	1.00
Fuel oil, two hardening furnaces, 60 gallons	3.00
Quenching oil, 1½ gallons	.25
Pyrometer ends	.25
Carbonizing boxes, average	2.50
Wear and tear on three carbonizing furnaces	.30
	$19.15

$19.15 ÷ 1,000 = $0.0192 per pound.

No account is made of the cost of power or other overhead expenses as they are the same in either case.

are the extremely long face in proportion to the cone distance and the long backing or overhang of the pinion on its bearing. The chances are all against getting a full bearing of the teeth throughout the length of face after the gears are hardened and the bores are ground to size. We would advise cutting down the length of face to not more than one-third of the cone distance and using a coarser pitch with a smaller number of teeth for the same diameters.

Another condition which it is necessary to guard against in gears of this kind occurs where a small pinion is made solid with the gear in place of the light hub, as shown in Fig. 3. There would be still greater risk on account of shrinkage strains in hardening this piece. The pinion section would naturally be weak when worked out of the center of bar steel or a solid forging and everything considered, it would be far better to make it separate from the gear.

Rules for Horsepower

All established rules for horsepower of gears, as far as I know, are based on the use of soft steel or cast iron. They usually allow a stress for steel or 2½ times that of cast iron. This may be correct as far as strength is concerned but it certainly is not right if wear is to be taken into account. We have found that gears of a good mixture of cast iron showing 35 to 40 on the scleroscope test for hardness, will withstand wear fully as well as open-hearth cast steel gears of the same size. Consequently we have compromised on one-half this difference in stress for steel, making it 1¼ instead of 2½ times that for cast iron.

This brings up the subject again of wearing qualities of case-hardened steel gears as compared with soft gears. We have equipped a number of electric motor drives with case-hardened gears, making them much smaller than the soft steel gears formerly used, with most satisfactory results. And judging by these records, we recommend a stress of four times the usual standard allowed for cast iron in standard horsepower rules such as the Lewis formula.

For example, in a 30-horsepower electric motor drive in connection with a positive pressure blower which we have in use, the original soft steel gears computed according to our standard rule for horsepower, required a pair as large as 49 x 16 teeth, 3 D P., 3¼-inch face and the case-hardened steel gears which we have had in use now for several years are 49 x 16 teeth, 4 P., 2¼-inch face. We consider this rating, four times greater than cast iron, is conservative as the gears which we have based our calculations on are considerably larger than automobile bevel driving gears smaller in size and transmitting more power.

As evidence of the advantage of case-hardened gears over alloyed tempered steel gears we may cite the standard automobile practice in beveled driving gears. I do not know of a single exception to the rule that automobile manufacturers use only case-hardened steels for such beveled driving gears at the present time. Their requirements call for the greatest possible combined durability and strength.

Fig. 4 shows the layout of our grinding department equipped with coal-fired furnaces which must be used continuously to produce the best results, since it requires about 24 hours from the start to bring them up to a carbonizing heat. On the other hand, there is no delay whatever in getting the required heat with oil or gas, and where there is not sufficient work to keep a furnace running *continuously* the oil or gas furnaces would undoubtedly prove the most satisfactory. An oil or gas furnace is necessary in any case for re-heating so that the same furnaces can often be used to advantage on carbonizing as well.

Most of our work requires the use of large carbonizing boxes and these naturally require a longer heat to penetrate than smaller sizes. In regard to the depth of carbon case in gears, we recommend one-eighth of the thickness of teeth at the pitch line, and not more than ⅛ inch deep in the coarsest pitches in machine tools. According to this rule, ½ inch pitch should have 1/32 inch carbon case.

At the present time, there are several makes of carbonizing compounds extensively used which have proved much more satisfactory than bone or charred leather. Care must be expressed to keep these compounds perfectly dry, not only in the packing of the boxes, but also after they are taken out to cool, for if any water is allowed to leak in when the material is hot a chemical action sets up which has the effect of blistering the case-hardened surfaces on the gears the same as if they were overheated. Short pieces of common machinery steel about ½ inch square are generally placed in the top of the boxes for test pieces, and before the work is taken out of the box these pieces should be hardened and broken to make sure that the depth of case is right.

It is a well-known fact that nickel alloy steels require a longer carbonizing heat than straight carbon steel, and in order to get a line on the proper depth of case, test pieces of the same material should be used along with the plain carbon steel test pieces so as to make a proper comparison. We find that it does not pay to use plain cast iron carbonizing boxes. Semi-steel is better and cast steel is best.

Oil Used For Quenching

We use mineral oil for quenching which has a 310 degree flash test and viscosity of 74 inches at 104 degrees. It is a thin petroleum oil which can be bought for 17 cents per gallon by the barrel. With tempering oils like this we find that a safe rule is to quench 1 pound of steel to a gallon every four hours, where no special arrangements are made for cooling the oil. With our cooling system we are able to quench 3,000 pounds of steel in eight hours with 700 gallons of oil. The tempering oil, as shown, is circulated through the inside of a radiator and we circulate our fuel oil through the outer jacket. The radiator is simply a power house water heater which is adapted to this purpose without change. We use the fuel oil for cooling because of its convenience. Greater efficiency, of course, could be obtained by having a flow of water for the purpose or by increasing the radiating surface. Our radiator has 30 feet of cooling surface.

We have never had any difficulty with over-heating of the oil with this system, no matter how fast the work is put through; it runs up occasionally to 120 degrees but never any higher. We figure on quenching about twice as fast as we could without the cooling system.

In leading up to the final cost of heat-treated gears, we submit an itemized form, Table I, which shows our actual cost of labor and materials in the heat treatment of chrome nickel tempering steels as compared with case-hardening in general.

Table II contains our actual cost of labor and materials in making up a small lot of miter gears complete from bar stock, using the various grades of steel referred to.

Heat treated gears in machine tools are on the side of superior quality and greatest efficiency. Therefore, they represent the standard and aim of American manufacturers. It is safe to say that within the next few years soft steel gears in machine tools will become a thing of the past just as gears with cast teeth were abandoned 20 years ago.

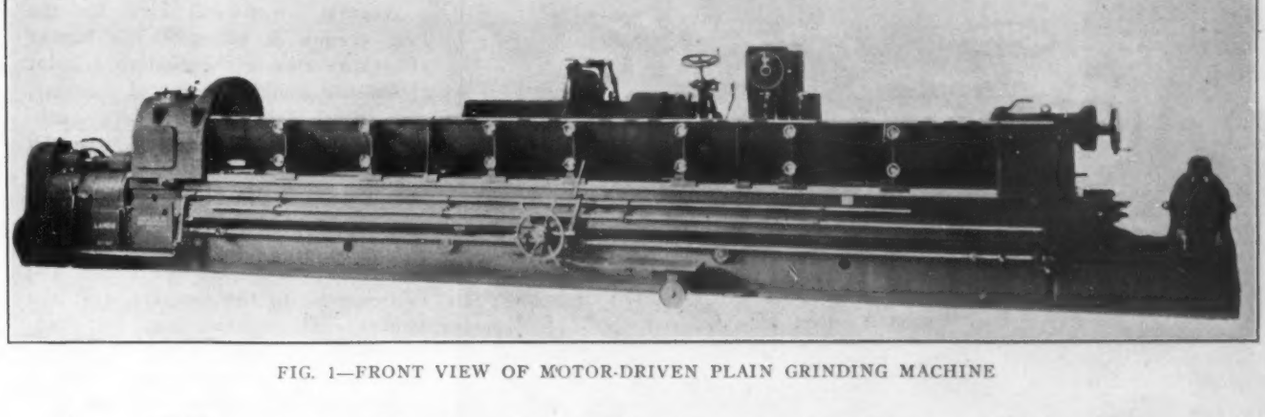


FIG. 1—FRONT VIEW OF MOTOR-DRIVEN PLAIN GRINDING MACHINE

An Electric-Driven Plain Grinding Machine

Grinding machines now are being extensively employed for finishing large work, such as engine crankshafts, steam turbine shafts, steel mill rolls, etc. A large electrically-driven plain grinding machine recently has been added to the line of grinding equipment built by the Landis Tool Co., Waynesboro, Pa. This machine is arranged for work 30 inches in diameter and 20 feet long, and is driven by three motors, one for operating the grinding wheel, one for turning the work and traversing the grinding wheel and the third drives the water pump. The work and traversing motor is belted to the gear box at the end of the machine, which is arranged with clutch mechanism so that the drives can be started and stopped independently or together, independent of the motor. The motor operates at a constant speed and the speed changes of both the work and wheel traverse are effected by an arrangement of gear shifts and clutches which are controlled from one position at the front of the machine. This grinding machine has 16 different work speeds, ranging from 2 to 45 revolutions, and 10 changes of wheel traverse speeds, ranging from 2½ to 84 inches per minute.

The grinding wheel is driven by a variable speed motor, the speed of which is controlled by the electrical apparatus mounted upon the main wheel carriage, illustrated in Fig. 4. The standard size wheel employed is 30 inches in diameter. This wheel has a wearing range of 8 inches in diameter, for which the electric controller is arranged to give the proper cutting or peripheral speed with the wheel at any size within its range of wear.

Grinding Wheel Motor

As shown in the rear view, Fig. 2, the grinding wheel motor is mounted upon a separate carriage which travels on a track formed with the base of the machine. The carriages are entirely independent with the exception of an arm connection for propelling the motor carriage with the traversing movement of the wheel carriage. The motor carriage is mounted on large rollers equipped with ball bearings. The track surfaces upon which this carriage travels are protected by metal guards. The electric current is transmitted to the wheel motor through sliding contact shoes and feed wires located along the body of the machine. The wires also are protected by a metal guard to prevent objects from falling upon them.

The grinding wheel slide for feeding the wheel to and from the work is arranged with a rapid mechanical feed mechanism operated by the vertical lever located between the feeding hand wheel and the motor. The controller is shown in Fig. 1. This design was adopted for the purpose of moving the wheel away from the work quickly when changing from piece to piece or from one size to another when various diameters are to be ground on the same piece, and also for feeding in the wheel quickly to the grinding position. The grinding wheel motor is controlled by an automatic starter and field rheostat with rheostat relay. This arrangement is efficient, as the controller can be set to give the wheel the proper peripheral speed for any size of diameter within its wearing range and the motor then is operated by an ordinary knife switch. Positive control of operation thereby is insured, and with the automatic starter the speed picks up gradually after the starting switch has been thrown into contact. All of the spindle bearings, which operate continuously while the machine is at work, are made of bronze and the spindles are made of hardened and heat-treated steel.

The starting box of the water

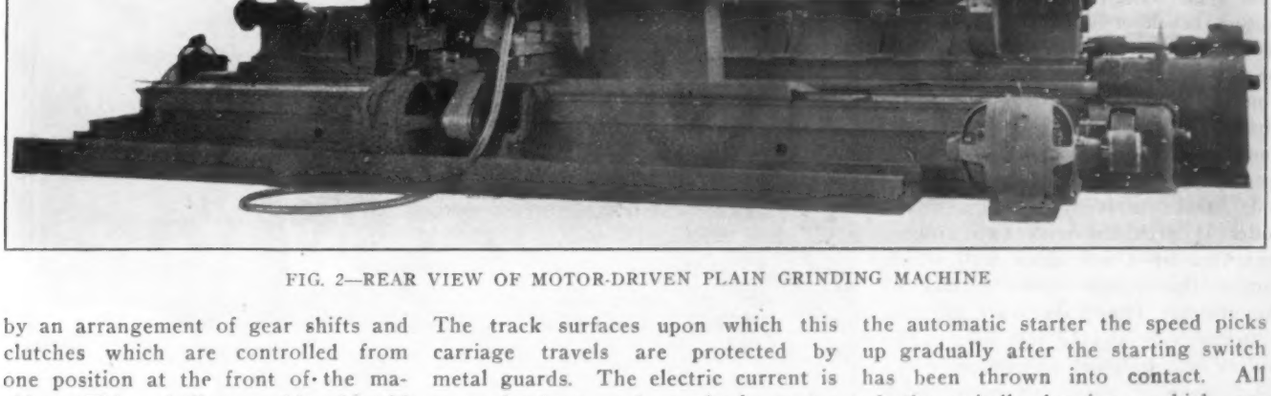


FIG. 2—REAR VIEW OF MOTOR-DRIVEN PLAIN GRINDING MACHINE

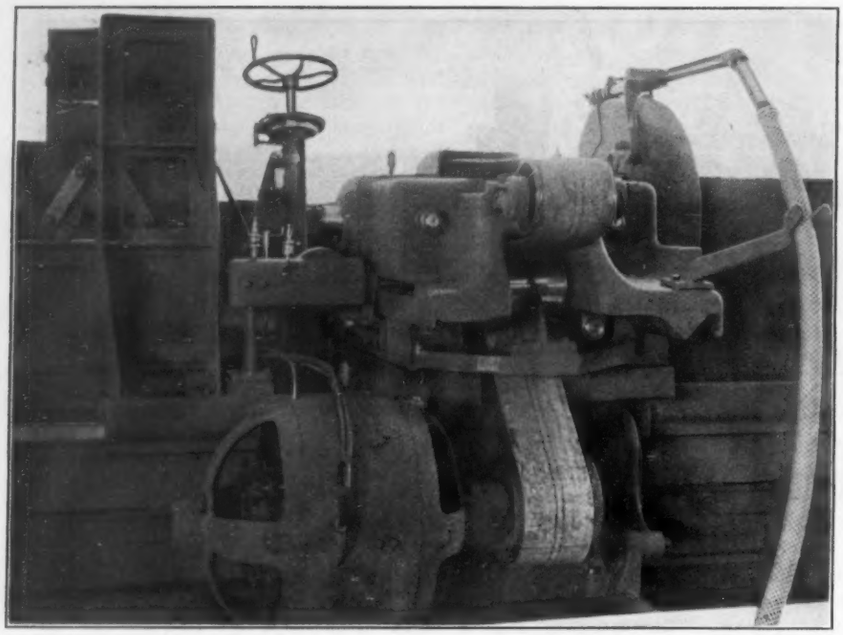


FIG. 3—THE GRINDING WHEEL DRIVE OF THE MOTOR-DRIVEN PLAIN GRINDING MACHINE

pump motor is mounted directly upon the motor itself, being within easy reach of the operator. This machine is designed for grinding a line of large shaft work, the largest piece to be handled occupying the full distance between centers, and the diameters will range up to 24 inches. It also can be built for a swing of 40 inches when desired.

Commonwealth-Edison Plant Extensions

The Commonwealth Edison Co., Chicago, recently has added two turbo-generating units to its Fisk street station, bringing the total capacity up to 165,000 kilowatts. The new units were furnished by the General Electric Co., and are rated at 20,000 and 25,000-kilowatts, respectively. The turbines are of the horizontal, Parsons type. Eight, cross-drum water tube Babcock & Wilcox boilers have been installed to furnish steam for the generating equipment. Each boiler contains 12,200 square feet of heating surface and about 20 per cent additional surface for superheating. They are equipped with chain-grate stokers and steel encased settings. Each boiler is provided with two stokers separated by a fire brick wall which comes slightly above the surface of the grates. The stokers are 10 feet, 6 inches wide and 13 feet long. The boilers are designed to evaporate 80,000 pounds of water per hour under full load. The maximum working pressure is 225 pounds per square inch, and the normal pressure 210 pounds. The superheaters will give 225 degrees Fahr. superheat when operating at or near their maximum capacity.

Special fuel and ash-handling equipment has been installed. Coal cars are brought into the plant on two unloading tracks, from which the coal may be dumped directly into the hopper of the primary crusher if the cars are of the drop-bottom variety; or if gondola cars are used, the coal may be unloaded by grab-bucket cranes and dropped over the side into the crusher hopper. The primary crusher is intended to reduce all lumps to about 3 or 4-inch cubes, and from it the coal is passed into the lower horizontal run of either of two Mead-Morrison overlapped bucket conveyors, which will care for the four groups of boilers. The bucket conveyors elevate the coal to a point above the boiler room coal bunkers, and deliver it to the secondary crushers to be reduced to ¾-inch size. All of the crushers were furnished by Orton & Steinbrenner, Chicago. From this point the coal is taken by a Robins belt conveyor, running at right angles to the bucket conveyors, and is delivered to the bunkers over the boilers. There are three belt conveyors for the four groups of boilers. The bucket conveyors each have a capacity of 175 tons of coal per hour at a speed of 45 feet per minute; the belt conveyors have a like capacity at a speed of 250 feet per minute. The capacity of the coal bunkers is 225 tons per boiler. In addition to the four station bunkers, there are four storage bins overhead in the car shed, with an aggregate capacity of 3,360 tons; the receiving hoppers have a capacity of 1,320 tons.

The removal of ashes will be accomplished by means of small, electrically-driven ash cars operating in the boiler-room basement. These cars discharge into a receiving hopper which delivers refuse to a bucket conveyor. The latter is used to elevate the ashes to a storage bunker above the track in the car shed, having a capacity of 1,180 tons. At this point the ashes are discharged into standard railway cars.

The turbo-generators will deliver current at 12,000-volts, 60 cycles. The installation was designed by Sargent & Lundy, consulting engineers for the Commonwealth Edison Co.

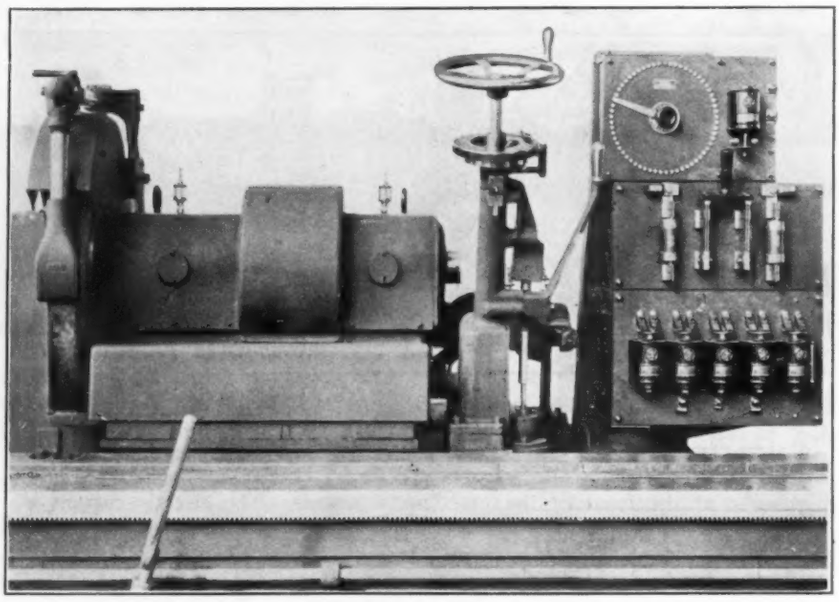
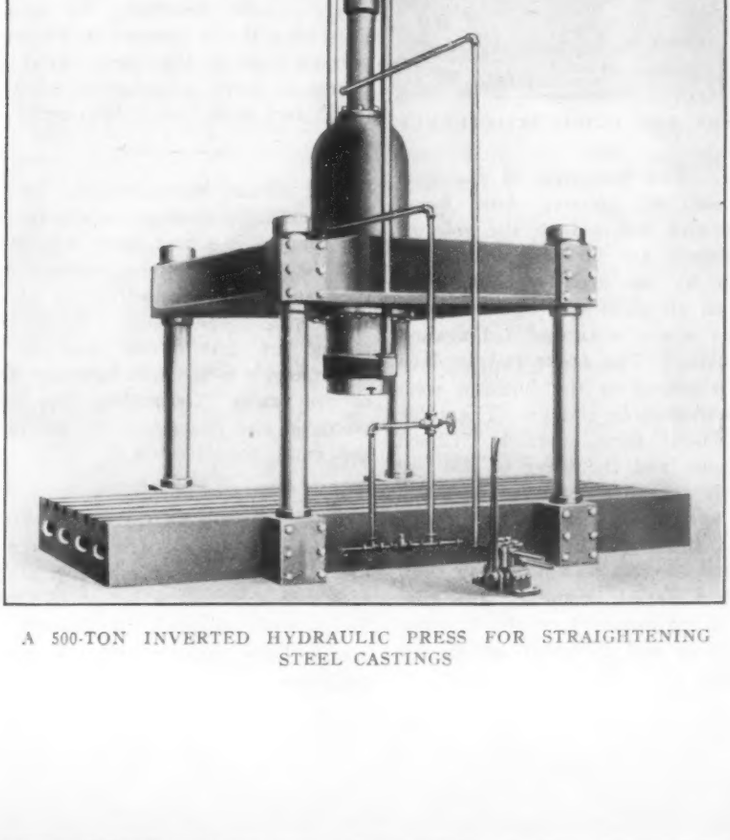


FIG. 4—FRONT VIEW OF THE GRINDING WHEEL HEAD AND ELECTRIC CONTROL APPARATUS

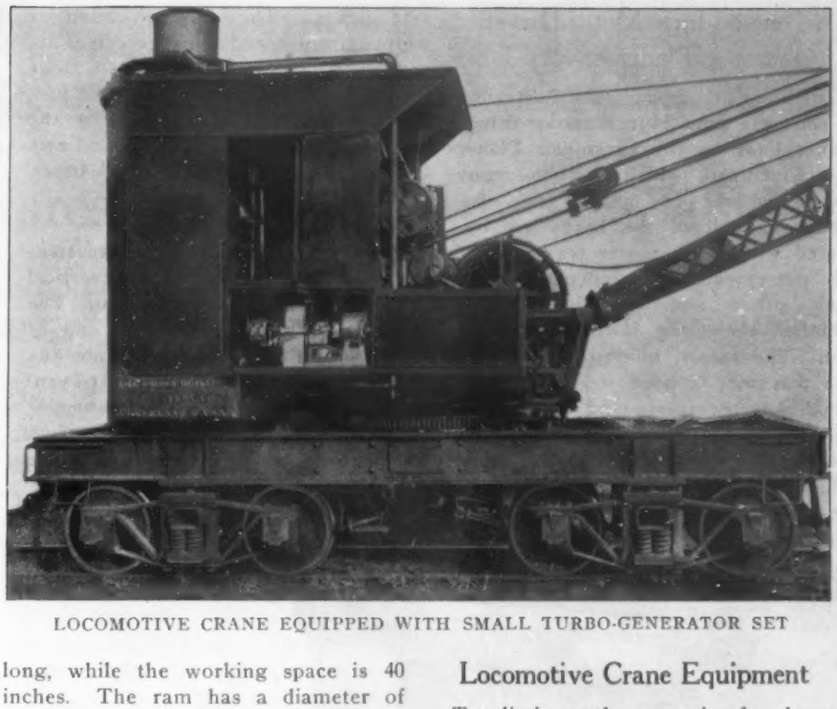
A 500-Ton Inverted Hydraulic Press

The 500-ton inverted hydraulic press, designed primarily for straightening steel castings, and illustrated herewith, also can be employed for other heavy straightening work necessary in large industrial plants. The press is operated hydraulically and by opening a valve the ram, of its own weight, drops onto the work. This action causes the hydraulic cylinder to fill from the surge tank, the pump not being required to fill the cylinder. When the stock has been straightened the pressure ram is returned to any predetermined point of its travel by the action of the pump pressure operating through a return ram in an auxiliary pull-back cylinder.

By shifting the lever of a double-acting operating valve the pressure is applied either to the pressure ram or to the return ram and permits the fluid to return to the surge tank, which also is used as a pump reservoir. When the pressure ram has returned a sufficient height to admit the work, the valve lever may be shifted to a neutral position, thereby holding the ram stationary until the operator is ready to apply the pressure. The press has a capacity of exerting a pressure of 500 tons. The bed is 6 feet wide and 12½ feet long, while the working space is 40 inches. The ram has a diameter of 20 inches with a travel of 24 inches. The strain rods, made of forged steel, are 5½ inches in diameter. The pressure ram is faced with an open-hearth steel plate which is provided with T-slots to which pressure blocks may be attached for various requirements. This press was designed and is built by the Hydraulic Press Mfg. Co., Mount Gilead, O.



A 500-TON INVERTED HYDRAULIC PRESS FOR STRAIGHTENING STEEL CASTINGS



LOCOMOTIVE CRANE EQUIPPED WITH SMALL TURBO-GENERATOR SET

Locomotive Crane Equipment

To eliminate the necessity for dragging power wires along the track on which locomotive cranes using electro magnets operate, experiments have made to equip these cranes with small engine-driven generator sets to furnish current for the magnet. A recent application of a small turbo-generator set for this work is shown in the accompanying illustration. The crane has a capacity of 15 tons with a 40-foot boom and has been equipped by the Brown Hoisting Machinery Co., Cleveland, with a 5-kilowatt turbo-generator set built by the Terry Steam Turbine Co., Hartford, Conn. The magnet, energized by current from this unit, is used for handling pig iron and scrap at any point within the reach of the boom. The crane is moved by a reciprocating engine and the swinging and elevation of the boom are taken care of in a similar manner. The small generator set, which is entirely independent of the other operating portions of the mechanism, is underneath the floor of the operator's cab, where it is entirely out of the way.

Among the special features of this unit is the indestructible rotating wheel, which is never affected by the passage of the large quantities of water due to starting up from cold. It is claimed that full power can be obtained in less than a minute and aside from occasional oiling, the turbine received no attention. The accurate balancing of the rotating parts practically eliminates vibration, thereby permitting the use of a small base, bolted rigidly to the crane.

A New 84-Inch Motor-Driven Planer

In the accompanying illustration is shown a new 84-inch motor-driven planer built by the Cincinnati Planer Co., Cincinnati, which embodies many novel features of design and construction. All of the heads are operated with rapid power traverse and all movements are independent of each other and can be effected whether the table is in motion or not. The motor, mounted on top of the machine, is used for driving the rapid power traverse and feed to the heads and also for elevating and lowering the cross rail and the pump which lubricates the ways. The motor pinion engages a large gear on the horizontal rapid traverse shaft, from which the pinion that drives the feed clutch receives its power. Near the center of this horizontal shaft a gear meshes into a pinion on the gear case of the elevating device, through which power is transmitted for raising and lowering the cross rail. A lever from this gear case is located at the left of the machine and controls the raising and lowering clutches in the gear case.

NEW 84-INCH MOTOR-DRIVEN PLANER BUILT BY THE CINCINNATI PLANER CO., CINCINNATI

The power feed to the tool heads receives its power from the driving clutch which has a bell crank and link motion to the bevel gear on the large horizontal shaft. This bevel gear meshes with the gear on the vertical shaft which in turn meshes with a set of spur gears to the trigger gears on the end of the rail and side heads. The driving clutch is tripped from a rod which receives its motion from the tumbler and dogs on the side of the table and bed. The amount of feed is varied by the graduated slot heads which indicate the exact amount of feed at all times.

Massive Box Housings

The rapid power traverse receives its power from the second vertical shaft on the side of the housing. The small handles, shown on the end of the rail and side heads, operate the rapid power traverse and feed. Turning these handles to the left engages the rapid traverse and to the right the regular feed, and in no case can both be engaged at the same time. The handle at the lower end of the rail is used for reversing the rapid traverse. The housings of the machine are of massive box form, tongued and doweled to the side of the bed and are further fastened at the top by an arch of box form closed on all sides and open only at the ends where it is fastened against the housing. The cross rail is deep and is clamped to the housing with inside and outside clamps. The table is of box form, heavily ribbed throughout, and the ways of the bed and table are oiled by a forced lubrication system from a pump at the back of the housing. The motor is connected directly to the driving shaft through a flexible coupling, the controller being mounted on the housing. Ten cutting and 10 return speeds are available.

Plant of Peninsular Steel Castings Co.

One of the largest crucible steel foundries in Detroit is operated by the Peninsular Steel Castings Co. This concern has been in business about a year and is now turning out 500 tons of castings annually. The shop of the company has facilities for handling heavy work, and recently finished one of the largest crucible steel castings ever made. This casting weighed 2,000 pounds. It took 20 pots of steel, which were pulled from the furnace and poured in 3½ minutes. The pouring time alone was 90 seconds; the skimming and carrying time was two minutes.

The molding floor of the Peninsular Steel Castings Co.'s foundry is 50 x 183 feet, the core room 25 x 36 feet and the cleaning and shipping rooms are each 48 x 50 feet. An annealing furnace is installed in the cleaning room. It is equipped with a pyrometer to insure uniform annealing.

The steel is melted in improved Milwaukee type crucible furnaces, burning fuel oil. Each furnace holds six pots placed in one large chamber. The pots are charged cold and the melting time is about 3½ hours. Usually four heats per day are obtained, giving an output per furnace of 24 pots of steel or about 2,600 pounds, with a consumption of 300 gallons of fuel oil. The furnaces are fed by gravity from a 1,000-gallon tank located in one corner of the shop. This tank is placed inside the building so that the oil will run properly in cold weather. It is connected with a large underground storage tank in the yard. Four furnaces are now in operation, each being 5 feet wide and 9 feet long.

The Hyman-Michaels Co., People's Gas building, Chicago, recently sold 300 tons of 80-pound steel rails, which will be used in the construction of the vaults of the sub-treasury at San Francisco. The rails will be employed as reinforcing material for the concrete which will form the walls of the vaults. Grant Fee, San Francisco, is the contractor in charge of the vault construction.

Montgomery & Co., 105 Fulton street, New York City, dealers in tools, supplies and machinery, are offering to the trade a set of 48 Grobet Swiss files adapted particularly for use by tool makers and for general purposes.

IRON AND STEEL MARKETS

Iron Trade Shares Improvement in Sentiment

And Buyers Are More Interested in Contracting—Low Prices Bring Out Large Tonnages of Pig Iron in Eastern Territory

BY GEORGE SMART

The iron trade fully shares the greater cheerfulness of the business world, which has developed recently on account of the passage of the currency bill and the disposition of the national administration to cooperate with legitimate business rather than fight it. Buyers throughout the country are showing more disposition to contract for finished materials and often are willing to buy further into the future than the mills are willing to sell. Pig iron is still dull in many parts of the country, but in some centers, low prices have brought out considerable tonnage. In spite of these improved conditions, there is a striking contrast between the present and the close of last year, when, to almost an unprecedented extent, mill activities continued throughout the holiday period. This year mills are shutting down for an unusually long period. In some cases, blast furnaces are included on the inactive list. Most mills will, however, resume on Jan. 5. Last year, mills in eastern Pennsylvania were able to charge from 1.60c to 1.65c at their plants for plates, and 1.70c to 1.75c for shapes and ship them hundreds of miles, passing many mills of the central west, which were unable to make deliveries until far into this year. One large independent company came into the market shortly before Christmas, 1912, and in two or three days sold all the tonnage which it had to offer, including 60,000 tons of bars at 1.40c, Pittsburgh. This year, while prices are, of course, much lower, mills are conservative about contracting and are frequently asking $1 per ton more for delivery during the second quarter of next year.

An extremely interesting development is the announcement that the Steel Corporation will be an active competitor in the American market of German and English makers of ferro-manganese. The Corporation has already made a sale at about $2 below prevailing prices.

Pig Iron

Very low prices have resulted in considerable increase in pig iron buying in eastern territory, as many buyers are coming to regard present prices as bargains. The Central Iron & Steel Co., Harrisburg, Pa., has purchased 10,000 tons of basic for first quarter delivery at a price which is reported to have been as low as $14, delivered, which is the lowest price in the east for a number of years. A steel company purchased 10,000 tons of basic for first quarter and first half at about $14.25, delivered. A Bridgeport consumer of basic bought 10,000 tons for first quarter at $14.70, delivered. Foundry iron has also sold at low prices in the east and $14.75, Philadelphia, or $14, furnace, has been done. Virginia iron has weakened 25 cents per ton. The Pennsylvania railroad has bought from 3,000 to 6,000 tons of coke and charcoal pig iron and the Norfolk & Western has closed for 1,200 tons of various grades with Virginia makers. A Lynchburg pipe company has asked for 4,500 to 5,000 tons of pipe iron for first quarter. Inquiry has increased in the Pittsburgh district. The Standard Sanitary Mfg. Co. is in the market for 4,000 tons of No. 2 foundry for January and February, and 2,000 tons of southern for its Louisville plant. In southern territory, $10.50, Birmingham, for No. 2 is becoming a more general quotation, but some iron is still being sold at $11, and inquiry is much improved.

Coke

There is much more activity in the coke market. For furnace coke, $2, ovens, seems to be pretty well established as the price for first half delivery. The McIntyre Iron Co. has taken from 7,000 to 8,000 tons per month at that figure. Southern Ohio furnaces have also contracted. Cleveland firms are in the market for large tonnages, but have not yet closed.

Plates

The city of Ottawa will receive bids Feb. 3 on 85 miles of riveted steel pipe, which will require from 150,000 to 175,000 tons of plate. It is thought that American makers have a fair opportunity of getting this business.

Iron Ore

The shipments of Cuban iron ore by the Spanish-American Iron Co. for this year will be about 1,025,000 tons, the largest tonnage on record, and an increase of 100,000 tons over last year. Last year, at this time, contracting for the movement of ore was being done at a lively rate, but this year there is no thought of contracting at the present time, nor is any consideration being given to ore prices.

Pittsburgh Market is More Cheerful

Inquiry Much More Active—Mills Asking Higher Prices for Second Quarter Delivery—Coke Active

BY C. F. WILLIAMS

Office of THE IRON TRADE REVIEW,
2148-49 Oliver Bldg.,
Pittsburgh, Dec. 23.

Manufacturers of iron and steel products appear much more cheerful. They feel that prices have touched rock bottom and believe that a heavy buying movement will be enjoyed within the next few weeks. Inquiry for first half material has been coming out in good volume and tonnages are being offered at about current prices for first quarter delivery; for second quarter shipment, mills are asking about $1 a ton above levels representing the present market. Some officials, in close touch with the trade, predict that mills will operate as fully the second quarter of 1914 as they did in the corresponding period of 1913. The passage of the new currency bill is regarded favorably by a large number of manufacturers in this district.

The coke market has been decidedly active this week, and considerable tonnage has been sold at $2, ovens. Pig iron continues dull, although inquiry for foundry and malleable grades is fairly heavy.

Pig Iron.—The Standard Sanitary Mfg. Co. is in the market for 4,000 tons of No. 2 northern foundry for January and February shipment to plants at Pittsburgh and New Brighton, Pa., and 2,000 tons of southern foundry for its Louisville plant. Inquiries for northern foundry and malleable irons involved about 15,000 tons, although many of the inquiries are not general. Steelmaking grades are quiet. Bessemer and basic are nominally quoted at $15 and $12.75, valley, respectively, and malleable and foundry are listed at a spread from $13.25 to $13.50, valley, or 25 cents below the market of a week ago. Three, and possibly four, blast furnaces in the valleys will go out the early part of next month.

Ferro-Alloys.—Fairly heavy inquiry, much of which is indefinite, has come out for ferro-manganese, but no large tonnages have been sold. Fifty per cent ferro silicon has been held at $75, Pittsburgh, all year.

Plates and Shapes.—Inquiry for first half requirements has come out, and some manufacturers are offering plates and shapes at 1.20c for first quarter and 1.25c for second quarter shipment. The former figure is regarded as the bottom of the market by leading makers, although some mills have sold plates at 1.15c, for immediate shipment. Specifications thus far this month are slightly heavier than those received during the corresponding period of November.

Sheets.—The market for forward shipment is fairly steady, but galvanized, black and blue annealed sheets, for prompt shipment, are obtainable from some makers at 2.85c, 1.85c and 1.35c, respectively, for base size gages. Specifying has been heavier this month than last. Practically all the large mills in this district are down this week.

Rails and Track Material.—Indications are that some of the leading eastern railroads will soon cover 1914 requirements, and there is every reason to believe that tonnages placed will be as heavy as those awarded a year ago. Specifying has been much heavier this month than last. Negotiations have been opened for track equipment, and some tonnage already has been awarded.

Billets and Sheet Bars.—The market has been fairly active, and some consumers have covered first half needs on long term contracts. Leading mills in this district are holding billets at $20 and sheet bars at $21, mill, although occasional rumors are heard of limited tonnages of sheet bars being obtained at slightly less than the general asking price. The sheet bar market appears quotable at $21, mill.

Hoops and Bands.—The market is quiet. Hoops are nominally listed at 1.40c and bands at 1.20c.

Iron and Steel Bars.—Several important consumers of steel bars have opened negotiations for first half delivery, but some makers are hesitating about offering quotations for shipment beyond April 1. Steel bars are being held at 1.20c for first quarter. Iron bars are quiet, but indications are that the 1.40c quotation could be shaded. Cold rolled shafting also is quiet, and quotations are nominal. Some makers are asking 63 off for carload lots, but as low as 65 off is reported.

Tubular Goods.—Pipe mills continue to operate at nearly maximum capacity. Demand for oil country goods has not fallen off, although no large individual inquiries are pending. Iron pipe discounts are well maintained. The market for boiler tubes is quiet.

Muck Bar.—The muck bar market continues dull, and not enough tonnage is being sold to offer a line on prices. This product nominally is listed at $29, Pittsburgh.

Bolts, Nuts and Rivets.—Prevailing quotations are nominal, and do not represent the actual market. There has been no formal change in quotations, however.

Tin Plate.—Specifying the last fortnight has been satisfactory, and little or no complaint is heard from manufacturers of tin plate. The Wheeling Sheet & Tin Plate Co. is operating five of its 10 tin plate mills at Yorkville, O., where this interest recently completed a modern plant.

Wire.—The end of the season for wire products finds quotations somewhat irregular, but scarcely enough tonnage is being sold to warrant a change in quotations. Wire nails are nominally quoted at $1.55 a keg, although it is understood some tonnage has sold at $1 a ton under that figure. Many of the wire mills will be closed 10 days.

Wire Rods.—The market is dull, and the prevailing quotation is nominal. An attractive tonnage could be obtained at less than $25.50, Pittsburgh.

Coke.—The market for contract furnace coke, deadlocked for a fortnight is active, some of the more important consumers having closed requirements. A prominent valley interest has taken about 12,000 tons for January shipment, at $2, ovens. A Cleveland consumer is understood to have closed with a Pittsburgh seller for about 30,000 tons a month, for first half, but the price at which this coke was obtained is unknown. Another Cleveland interest is in the market for between 12,000 and 25,000 tons for shipment the first month of 1914, and it is reported that Corrigan, McKinney & Co. have figured. The Youngstown Sheet & Tube Co. is negotiating for about 60,000 tons a month for next year. The majority of coke sellers are holding blast furnace fuel at $2, ovens, although some shippers appear willing to shade that figure slightly. The Connellsville Courier, for the week ending Dec. 13, says production was 307,790 tons, a decrease of 13,137 tons compared with the week before.

Old Material.—The market has been too quiet to show either strength or weakness this week, and quotations are unchanged. Middlemen do not expect to see any improvement until after the market for finished lines becomes more normal.

More General Quoting on Chicago Base

But Prices of Finished Materials Are No Lower — Inquiry is Increasing, But Buying is Light

BY H. COLE ESTEP

Office of THE IRON TRADE REVIEW,
1521-23 Lytton Bldg.,
Chicago, Dec. 23.

As the year draws to a close general relief is expressed by leaders in the iron and steel industry over the passage of the currency bill. It is believed that this measure will be of material assistance in reducing the credit stringency which is the principal cause of the prevailing trade depression. Prices of finished materials are no lower, although a minimum quotation of 1.25c, Chicago, has appeared on steel bars. This simply reflects the prevailing tendency to quote f. o. b. local mills. Inquiry is increasing and if steel makers were less cautious about contracting for the future, buying would undoubtedly appear on a much larger scale. Plates and shapes are held at 1.15c and 1.20c, Pittsburgh, respectively. An inquiry for 23,000 tons of standard rails has appeared.

Pig Iron.—A quietness consistent with the season of the year has settled over the pig iron situation. Liberal buying by large interests during the past 10 days has apparently failed to influence the average foundryman to consider his requirements. Prices of local foundry grades range from $14 to $14.50 at the furnace and makers are endeavoring to avoid taking $14 tonnage for the entire first half. A local manufacturer of malleable specialties has purchased 1,200 tons of Federal iron for early shipment. Southern furnace representatives are shading the $11 price with the result that a majority of the tonnage is now moving at $15.10, Chicago, equivalent to $10.75, Birmingham. Some of the better brands are still selling at $11 flat. The Kalamazoo Stove Co. has purchased 400 tons of 4 per cent silicon iron. A new stove foundry in southern Michigan is in the market for 600 tons of southern foundry grades.

Merchant Bars.—Inquiries are more numerous and there is considerable evidence that buyers are arriving at the point where they believe it would be wise to cover for their requirements. The mills are resisting efforts to contract very far into the future and on account of this attitude, the situation is developing more slowly than might otherwise be the case. Soft steel bars have been sold down to 1.25c, Chicago, but it would not be fair to figure this price back to the Pittsburgh basis because a purely local market exists. Extremely low prices are not being made on the majority of the tonnage and some of the mills are making an effort to preserve the 18-cent differential between Chicago and Pittsburgh. With one exception, the iron mills in this territory are operating at 40 to 50 per cent capacity. Bar iron has been sold down to 1.12c, Chicago, recently, which is apparently the minimum for the time being. Any quotations on hard steel are purely nominal owing to the almost total lack of business, but it is believed that an offer of any appreciable tonnage would bring out a price of 1.30c, Chicago. The Inland Steel Co. has closed its Chicago Heights re-rolling plant for an indefinite period. The same company will close its bar mill and other departments at Indiana Harbor from Wednesday night until Sunday night only. Lower warehouse prices have not served to bring out any additional business.

Plates and Structurals.—There is a more hopeful sentiment which has some foundation in fact, although, of course, no noticeable activity is expected until well into next month. Prices are now lower. Both plates and shapes may be obtained on a basis of 1.15c, Pittsburgh, equivalent to 1.33c, Chicago, although strong efforts are being made to maintain shapes at 1.20c. It is probable that the Illinois Steel Co. will furnish the greater portion of the steel included in two fabricating contracts let in Chicago last week, aggregating 3,800 tons.

Rail and Track Fastenings.—A rather anomalous situation has developed through the receipt of fairly liberal orders, inquiries and specifications for track fastenings coupled with an almost total lack of interest in standard rail requirements. Aside from an inquiry for 23,000 tons from a western line, the heavy rail situation is devoid of activity. Light rail business is fairly well maintained. Although prices on track fastenings are low, nothing under 1.50c, Chicago, for spikes and angle bars has appeared.

Bolts, Nuts and Rivets.—Business is limited and it will undoubtedly be several months before some of the new plants in this district are paying expenses. There is a slightly firmer tone in the structural rivet situation, resulting from the sentimental improvement in the general feeling of the trade.

Sheets.—Sheet consumers are showing more anxiety to contract than users of other classes of steel. Most of the mills are firmly resisting the temptation to commit themselves very far into the future at present prices. A few contracts for six months have been entered, but practically all of the business of this character has been limited to the first quarter of 1914. For prompt mill shipment, quotations of 2.03c, Chicago, can be obtained for No. 28 black and 3.03c for the same gage galvanized sheets.

Wire Products.—There are practically no new developments in the wire situation. The prevailing price adjustments are admittedly delicate, but further declines are not expected unless the situation gets worse.

Cast Iron Pipe.—New orders for both water and gas pipe are light and the foundries have been forced to materially curtail their production. The mild winter has been of assistance in lengthening considerably the period during which pipe may be laid in northern states.

Merchant Pipe and Tubes.—Merchant pipe mills are comparatively well filled up with orders and discounts are apparently being well maintained. There is no improvement in the demand for boiler tubes.

Old Material.—The year closes with Chicago scrap prices in many cases lower than at any other time in the history of the industry. Also it is evident to keen market observers that the decline has not wholly spent itself and each week brings out a few new low quotations. During the past 10 days, cuts have been made in shafting, steel axles and pipes and flues. The mills are maintaining their cautious buying policy and the volume of business is not sufficient to encourage much purchasing for speculative purposes. Railroad offerings are being fairly well absorbed, and this is one of the few encouraging features of the market. The St. Louis & San Francisco sold 450 tons on Dec. 24, including 300 tons of No. 1 wrought. The C., M. & St. P. sold 2,632 tons Dec. 23, including 1,000 tons of rerolling rails and 200 tons of frogs, switches and guards. The Chicago & Alton and Burlington have also issued lists recently.

Little Activity in Cleveland Market

But Prices are Somewhat Firmer—Large Tonnage of Furnace Coke Pending—Mills Idle for Holiday Period

BY GEORGE SMART

Office of THE IRON TRADE REVIEW,
Penton Bldg.,
Cleveland, Dec. 23.

Iron Ore.—As noted in these columns elsewhere, the amount of ore on dock Dec. 1 is the smallest in several years, which is not saying, however, that it is not ample for all requirements. The movement from dock to furnaces since the first of December has been very light, but the December movement is never very heavy. Owing to the fact that the ore vessels carried more cargo per trip and received 5 cents a ton over the 1912 rate, vessel owners were enabled to do a profitable business and all of them have been able to declare dividends from 6 to 10 per cent. The ore shippers, however, carried a greater portion than ever of their requirements in their own ships. It is likely that the ore rate as established in 1913 will stand, as it was conclusively proved in 1912 that even the largest carriers, working exclusively in the ore trade, could not break even at 40 cents. In fact, were it not for the very heavy movement of grain at fancy rates during 1912, none of the fleets would have made any money. No steps have as yet been taken to establish the 1914 market and probably will not be for some time.

Pig Iron.—The market continues quiet with buyers showing very little interest in contracting for the first half of the new year. Some business, however, is being done from time to time and prices are unchanged. Sellers expect an increase in buying soon after the inventory season is past.

Coke.—The coke market is firmer, and $1.90 seems to be the minimum for January shipments of furnace coke and $2 for contracts covering the first half of the year. It is doubtful whether coke could be purchased for delivery throughout the year at $2. A Cleveland firm is in the market for a large tonnage, but has not yet closed. Foundry grades are quiet with prices unchanged.

Finished Materials.—The increased interest of buyers in contracting, especially for bars, has been maintained, and prices on some products are firmer. On wire, lead makers are not contracting as far ahead as they did recently and the market is somewhat stronger. On sheets, there is a growing tendency to quote mill prices rather than to adhere to the Pittsburgh basis, and some quotations figured back to Pittsburgh are considerably lower than recently quoted prices, but the prices are equivalent to 1.85c to 1.90c on black, 2.85c to 2.90c on galvanized and 1.35c to 1.40c on No. 10 blue annealed at the mills. On steel bars, 1.20c, Pittsburgh, seems to be the minimum. On 1,000 tons for which the Republic Structural Iron Works is inquiring, several makers quoted 1.30c. Structural shops are fairly busy at present, but unless new orders come in soon, the time is not far distant when they will be badly in need of business. Mills in the Cleveland district will be idle for an unusually long period during the holidays. Most of them, however, will resume Jan. 5.

Old Materials.—Little business is being transacted in the local scrap market. Consumers are not buying for immediate delivery, and are somewhat hesitant in placing orders for January and February delivery. We quote heavy steel $9 to $9.50. There is something of a deadlock in this description; the only consumer willing to buy at all offers $9.50, while some dealers have been experiencing difficulty in covering recent short sales around this figure. Prices in other descriptions are unchanged. In the valleys, several large mills have about filled their requirements for the first quarter. At Youngstown, the Brier Hill Steel Co. has taken a fair sized tonnage for its new open-hearth plant; this company is expected to be a large consumer of steel scrap when normal conditions are restored in the iron and steel trade. The National Malleable Castings Co. has also contracted for several thousand tons of heavy steel for its Sharon, Pa., steel works. We quote heavy steel, $10.50 to $10.65, valley.

Petition Refused.—A petition to have the Dayton Coal & Iron Co., at Dayton, Tenn., thrown into bankruptcy has been disallowed by Federal Judge Edward T. Sanford, at Chattanooga. This petition was presented by attorneys for the James Supply Co. and others, and was heard beiore Judge Sanford on Dec. 10. The chief charge was that the appointment of H. F. Noyes and A. Bowman as receivers by the chancellor at Dayton, Tenn., last summer, when the Dayton Coal & Iron Co. was thrown into the hands of a receiver, was made at the request of certain creditors who were actuated by the company itself. Judge Sanford, however, ruled that no proof could be found to these claims. It is reported from good authority in Chattanooga that a reorganization of the Dayton Coal & Iron Co. is under way.

SMALL TONNAGE

Pending in St. Louis Territory—Sales Also Limited.

BY E. C. ERWIN

Office of THE IRON TRADE REVIEW,
St. Louis, Dec. 23.

Pig Iron.—Actual inquiries pending in the St. Louis territory are for 1,000 tons of malleable and 300 tons of Southern No. 2 pig iron, each for delivery over the first half of next year. The two tentative inquiries, each for 2,000 tons of southern No. 2, that have been out from Quincy, Ill., for several weeks, have not been withdrawn, which would seem to indicate that the prospective purchasers have been unable to get iron at $10.50, the figure at which they are said to have declared they would buy. Sales last week were restricted to 600 tons of southern No. 2 to a local stove plant, and several scattering orders for smaller amounts. Local agents are not looking for better conditions until after the turn of the year, but insist that the price of southern No. 2 is firm at $11, Birmingham basis. Northern iron is quoted at $14.25 to $14.50, Chicago, and $13 to $13.50, Ironton.

Coke.—Some little activity was shown in the coke market last week by the purchase of 600 tons for first half delivery. Connellsville foundry coke, 72-hour grade, is quoted at $2.75, ovens, but business is almost at a standstill.

Old Material.—Prices in scrap are unchanged, with the possible exception of stove plate which has risen 50 cents a net ton. Lists are scarce, and dealers are not expecting better conditions until after stock-taking.

The A. B. Stove Co., Kalamazoo, Mich., has organized the A. B. Enameling & Foundry Co. and a plant for the manufacture of gray iron stove castings has been constructed. This shop will be operated in close harmony with the A. B. Stove Co.

Increased Pig Iron Buying in East

An Increasing Number of Consumers Regard Present Prices As Bargains—Ottawa in Market for Large Tonnage of Plates

BY C. J. STARK

Office of THE IRON TRADE REVIEW,
326 Real Estate Trust Bldg.,
Philadelphia, Dec. 23.

Suspensions of operations of steel works and blast furnaces in eastern Pennsylvania for the holiday period are proving very complete this year owing to the lack of pressing orders. Generally the steel works and mills will be down from Wednesday night, Dec. 24, to Monday, Dec. 29. The Alan Wood Iron & Steel Co. shut down Dec. 20, however, to be idle two weeks or longer. Some steel works furnaces are being banked. A better sentiment characterizes the finished steel market and makers are accumulating forward business in the form of contracts, but current orders usually are light. With one eastern works depending largely upon railroad work, new business lately has been but 20 per cent of capacity. About 25,000 tons of basic iron were sold in this district in the week at unusually low prices. Foundry sales are heavier with prices irregular. Steel scrap is the lowest in many years and some grades, it is believed, never before have been quoted at ruling values.

Pig Iron.—Savage slashing of prices, especially in basic iron, has accompanied an increased selling movement in eastern Pennsylvania territory the past week. Basic, after having been at a nominal figure of $15, delivered, for some weeks, has dropped to $14.25, delivered eastern consuming points, and even lower is rumored. These prices are equivalent to about $13.50 or less at furnace and represent the lowest level of this grade in about two years. Total sales of basic by eastern makers aggregate fully 25,000 tons. The Central Iron & Steel Co., Harrisburg, which is about to blow out a furnace, closed for 12,000 tons for first quarter with two furnaces, and is reported to have shaded $14.25, delivered. A Bridgeport, Conn., buyer took 6,000 tons for first quarter and another eastern Pennsylvania consumer 8,000 to 10,000 tons, some for first half, though details of the last transaction are lacking. An inquiry for 1,000 tons of early basic is current. Northern No. 2X has sold at $14.75, Philadelphia, a stove maker taking 1,000 to 1,500 tons for forward shipment at this price. Some reports of $14.50, Philadelphia, being done lack confirmation. Most of the standard brands of northern No. 2X are held at $14.25 to $14.50, furnace, and $15 to $15.25, Philadelphia. Virginia iron has weakened 25 cents, for while open schedules are unchanged $12.75, furnace, for No. 2X for first quarter is being done on offers. The Pennsylvania railroad has distributed about 6,000 tons, the maximum tonnage asked, of No. 2X low silicon and charcoal iron for first quarter. Central Pennsylvania makers received the coke iron. The Norfolk & Western railroad also closed for about 1,200 tons of different grades for first quarter, which went largely to Virginia makers. A Lynchburg, Va., pipe foundry has out a new inquiry for 4,500 to 5,000 tons of Nos. 3, 4 and forge, first quarter delivery. A local buyer wants 400 tons of early malleable. Low phosphorus sales are small at unchanged prices.

Iron and Steel Bars.—One leading maker of steel bars is quoting 1.20c, Pittsburgh, for first quarter and 1.25c for second quarter, equivalent to 1.35c to 1.40c, Philadelphia, and has booked some contracts on this basis. Others will do 1.20c for early shipment, but ask more on contracts. Buyers generally are more interested in contracts, but current new business shows little gain. Common bar iron prices range from 1.15c to 1.25c, mill. Tonnage is light. Shafting is weaker and 64 off for carloads and 62 off less carloads is being quoted, with a possibility of a further shading of one point.

Plates.—Continued activity in booking contracts is reported by some eastern plate mills. One works entered fully 15 to 20 contracts in the week for first quarter delivery, some of them from the largest class of buyers, at 1.25c, Pittsburgh base, or 1.40c, Philadelphia. The aggregate tonnage was large. This same producer entered new business at about 90 per cent of capacity. Middle western mills are quoting 1.20c, Pittsburgh, or 1.35c, Philadelphia, on first quarter plates. Inquiries are pending for 1,800 tons for the city of Baltimore and 1,200 tons for Schenectady, both for pipe lines. The Newport News Shipbuilding & Dry Dock Co. is low bidder on a transport and a supply ship for the navy department, which will require about 8,000 tons of steel. It develops that the two large ocean vessels for the Emery interests, Boston, went to the Fore River Shipbuilding Corporation instead of to the Cramp yard, as reported. Some time ago the latter took two 10,000-ton boats, but details concerning the purchaser have never been announced.

Structural Shapes.—New business remains very light with eastern shape mills, and the better activity in other products is not shown in this line. The usual minimum of prices is 1.20c, Pittsburgh, but with their plants operating so slowly, it is indicated 1.15c might be done on an attractive specification for immediate rolling by some eastern producer.

Sheets.—A number of buyers are offering to contract as far ahead as first half, but makers are not willing to accept present prices for that period, and usually ask for early specifications. The mills decline to accept 1.40c, Pittsburgh, but will do 1.45c, Pittsburgh, or 1.60c, Philadelphia, for No. 10 gage blue annealed. The Lackawanna railroad is reported to be figuring on 1,500 tons of light plates. The sheet mills of the Alan Wood Iron & Steel Co. have been closed down for at least two weeks and perhaps longer.

Semi-Finished Steel.—The Alan Wood Iron & Steel Co., the leading eastern seller of billets, suspended operations at its steel works and mills Saturday, Dec. 20, and will be idle until Jan. 5 or longer, depending upon the value of new orders. More buyers are inquiring for contract propositions, but makers are reluctant to sell ahead at today's prices. A Chester buyer asks 2,500 tons of special forging billets for first half. Rolling billet prices in this district now are about $21.50 to $22.50, delivered.

Old Material.—Prices seem somewhat more stationary, but this is not surprising in view of their extraordinarily low stage at present. A Schuylkill valley steel maker taking 1,000 tons or more of heavy steel at $10, delivered, obtained the lowest price for this grade in its history. Merchants say heavy steel is now at the most depressed value in 15 years, and that they have never seen such low prices in turnings and forge scrap as now exist. Some producers of scrap refuse to consider moving it at today's prices and are accumulating tonnage. In a few grades a slightly better demand is noted.

Lower Southern Prices More General

But General Quotation is Still $11—Cincinnati Market is Very Quiet—Southern Ohio Furnaces Buy Coke

BY S. G. BACKMAN

Office of THE IRON TRADE REVIEW,
503 Mercantile Library Bldg.,
Cincinnati, Dec. 23.

Pig Iron.—The minimum price of $10.50, Birmingham basis, for southern No. 2 foundry iron has been more definitely established within the past week, but it is still very limited as to makes and tonnages. Deliveries specified at this figure do not as a rule extend over the first quarter or for immediate shipment, but in some cases these might be made to cover the entire first half. The general quotation, however, at which both Alabama and Tennessee iron is being held is $11, Birmingham basis, for No. 2 foundry iron, for either prompt or contract shipment, and more iron is probably being sold at this price than at $10.50, Birmingham, because more furnaces are holding at the higher figure than at the lower.

The prevailing quotation for southern Ohio No. 2 foundry iron is $13, Ironton, for either spot or first half shipment. Rumors of lower prices for immediate delivery have thus far developed to be untrue, and it is not known that any one has sold southern Ohio iron below $13, Ironton basis. Sales at $13, Ironton, are being reported frequently, mostly for nearby shipment.

The market is very quiet, sales and inquiries being very light and mostly for actual requirements to cover periods of not over a month at a time. The Louisville & Nashville railroad has taken 500 tons of southern iron for the first half, but the Standard Sanitary Co. has postponed closing its inquiry for 2,000 tons for its Louisville plant. It is not generally expected that any new developments will occur in the market until after the first of the year.

Coke.—A sale of 18,000 tons of furnace coke has been made to southern Ohio furnaces to extend over the first six months of next year with deliveries of 3,000 tons each month. This is the only transaction of importance that has been reported here and the market as a general rule is quiet and unchanged. Prices are given the same as those last week, but in some instances they are rather weak. A general better buying movement is not expected until after the first of the year, as most of the melters and furnace operators are taking inventory at the present time. The Connellsville district remains the weakest, principally because the production there is a little in excess of the consumption. The Wise county and Pocahontas districts are probably the strongest, as consumption and production are about equal in both. The New River district is also fairly strong as there is no furnace coke to be had from these fields and most of the foundry coke is also contracted for.

Finished Material. — Warehouse prices are unchanged following the decline of $2 a ton on steel bars, iron bars, plates and shapes, and blue annealed sheets which occurred about the middle of December. Business is very quiet and no improvement could hardly be expected until after the first of the year. Most of the contracts being closed at the present time call for delivery during the first three months of 1914, but it is very evident that buyers are postponing purchasing until conditions have become more settled. The minimum price on steel bars is 1.75c; iron bars, 1.70c; plates and shapes, 1.85c, and blue annealed sheets, No. 10, 2.05c to 2.10c.

Prices are also unchanged in regard to the local sheet market. The local mill is receiving satisfactory specifications on both old and new contracts, the latter being generally for 1914 delivery. The mill is now about three weeks behind on shipments, and is holding at the following quotations, f. o. b. Newport, Ky., and Cincinnati: Black sheets, No. 28 gage, 2.05c to 2.10c, and galvanized sheets, No. 28, 3.05c to 3.10c.

Old Material.—The scrap iron market continues very dull with no indications of a change before the first of the year. Dealers, as a general rule, state that they will not attempt to get much business until after the first of January, as users are generally taking inventory at this time of the year and are not interested in buying. The demand has been very light throughout the present month, which could partly be attributed to the steady falling off in the foundry business in this territory during that time. The railroads are offering some large lists, but there is already a large surplus on the market. There is also a large amount available throughout the rural districts that is not being collected because of present low prices. Quotations are very uncertain, are fluctuating a great deal and it is rather hard to place them at any definite level because of the lack of transactions which could be used as test or a basis of comparison.

The new plant of the Michaels Foundry Co. will be located on Scott street, Covington, Ky., a site having recently been purchased there for $16,500. The property includes a four-story office building and a one-story warehouse. The latter will be used for the brass foundry and the office building will be converted into one for manufacturing purposes.

The Coast Mfg. Co., Seattle, Wash., advises it is incorporated to manufacture the Hercules whiffletree, window weights, meat saws and garden hoes. Capital now is $50,000, but it is purposed shortly to increase this to $1,000,000. Three plants are to be erected, one at Seattle, one in or near Wisconsin and the third in Virginia or the Carolinas.

The American Combustion Co., New York City, advises it is incorporated at $50,000 to manufacture oil gas generators, gas engines and crude oil burners. Officers are: President, Neville Cain; vice president, Edgar Trenteseau; secretary, J. P. Horgan. A plant will be built later, after experimenting and development has been completed.

Incorporation of the Coeur d'Alene Hardware & Foundry Co., Wallace, Idaho, precedes consolidation of the Coeur d'Alene Hardware Co. and the Coeur d'Alene Iron Works, with capital of $500,000. Eugene R. Day, James F. McCarthy and Ellis L. Hale, Wallace, Idaho, are the incorporators.

The plant of the Diamond State Steel Co., Wilmington, Del., has been ordered sold Feb. 16, the trustees asking immediate action as the expense of caring for the idle plant is great. The property will be offered in its entirety and then in lots, the highest aggregate bid to be accepted.

The Royal Crown Soaps, Ltd., Vancouver, B. C., advises its projected plant is in the hands of architects. It is to be of reinforced concrete throughout and the cost is to be about $250,000.

More Encouraging News from England

Higher Prices Being Asked for Pig Iron for Forward Shipment—Tone of Finished Material Markets Improved

BY J. HORTON

Office of THE IRON TRADE REVIEW,
Prince's Chambers, Corporation St.,
Birmingham, Eng., Dec. 3.

Pig Iron.—The position of pig iron this week is more encouraging than for some months past. The Cleveland market has been steady for some weeks, and a very good sign is that for forward contracts, covering the next quarter, a premium of 2s is asked for by the makers. Buying is not yet on a large scale, but many consumers are getting into difficulties for want of supplies, and are heartily sick of the day-to-day method of doing business. Makers are now exercising caution, and will not accept large orders without a fairly substantial advance. Yesterday's quotation at Cleveland was 49s 7d ($12.14) with 51s 6d ($12.36) three months. The warrant stock shows a reduction of 1,200 tons since the beginning of the month, while shipments are 21,000 tons. The amount in store is 144,000 tons. In the Midlands, it is generally believed that a new buying period has commenced. Smelters are very determined not to sell at a loss, and if the present promise of improvement is not realized in the new year, more furnaces will be blown out.

Finished Iron and Steel.—The tone of the finished iron and steel market during the past few days has improved in nearly all directions. A very good sign is the further advance in galvanized sheets, which have been gradually recovering during the past few weeks. Several firms have been able to make their minimum £11 ($53.58) to £11 5s ($55.10), and some firms are quoting £11 10s ($56.36) for March delivery. Somewhat lower prices are accepted by the great firms on the Welsh coast.

The rising prices are not altogether unconnected with a rumor prevalent on the Birmingham exchange on Thursday that the old Galvanized Sheet Association is about to be re-established. This well-known combine broke down about three years ago after a very successful career during which prices ran up to £13 17s 6d, or about £3 ($14.68) above present prices. This figure was realized in May, 1907.

The sheet improvement has had very good results on the raw steel market, which has been aided also by some recovery in the tin plate trade. The general effect has been to harden quotations for billets and bars. This has been assisted to some extent by a little relaxation of pressure of continental competition. The Belgians and Germans are not forcing their material on to the British market, with quite the same zeal as they were. Apparently, the price-cutting there has run selling prices below the profit margin and the local agents report that Belgian bar mills are now sold until the end of January. The British steel makers have had a nice addition to their order books during the past fortnight and the scramble for business has been, therefore, somewhat relieved.

In the tin plate trade, there is a decided improvement in demand, although not sufficient to affect prices. A number of the large works are booked for the first three months of next year, but prices are so unremunerative that makers are cautious about accepting further business at present rates. Generally speaking, steel makers look forward hopefully to the new year as likely to materially improve their position.

The iron trade shows very little improvement, and some of the largest firms, who resolutely refused to come down to the general low level, have now had to fall into line, as the only alternative to losing their customers altogether. Bars and hoops are slightly cheaper, under the pressure of ruthless competition.

MORE ACTIVITY

Expected in Southern Iron Early in the New Year—Stocks Reduced.

Office of THE IRON TRADE REVIEW,
Birmingham, Ala., Dec. 23.

Pig Iron.—The pig iron market is without special feature for the week just past. Inquiries were not so numerous as the previous week. Some tonnage that was pending at that time failed to be entered, but a very fair volume of orders was entered, aggregating some 7,250 tons. Of this amount 2,000 tons were entered in lots of carload to 250 tons and specified prompt delivery, and 5,000 tons, in 250-ton to 500-ton lots was to be delivered through the first quarter of 1914, all of which was at $11 to $11.50 per ton for No. 2 foundry, basis, Birmingham. Special analysis iron, amounting to 250 tons, was also entered for prompt delivery at $12.50 to $13 per ton, according to analysis. Very little charcoal iron was sold during the week, but the price remains firm at $25 per ton for this grade of iron. Every phase of the pig iron interest warrants renewed expectations for more activity in its production and sales immediately after the holidays in this district. The compilation of stocks on Jan. 1, 1914, will show very great reductions, both as to furnace holdings and also warrant iron. The increased consumption in this district will be a factor in the increased demand, as well as the small stocks of raw material on yards of consumers. No authority for rumors of a very much greater production of iron after the holidays has as yet been ascertained. The report of large shipments of ferro-manganese ore being received is without confirmation from the consignee.

Cast Iron Pipe.—Conditions are very much the same as last reported in the cast iron pipe manufacture. Some small requirements are going forward each day, and operations have not entirely stopped in any instance. Stock-taking and needed repairs are helping to keep the force organized in readiness for expected business soon. Plants that have reduced force have given notice of full resumption early in January and short time operations will go back to full time.

Old Materials.—Business in scrap iron is almost at a complete standstill. Only contract tonnage is moving. Sales are confined almost exclusively to bargain tonnages, and no tonnage is being taken except at a bargain price.

Acquires Iron Ore Mines

W. S. Kemmerer, of Philadelphia, and associates have completed the transaction for the taking over of the capital stock of the Forest of Dean Iron Ore Co., including the old Forest of Dean mine and other property along the Hudson river in New York state. The new owners have renewed to the Hudson Iron Co. the lease upon the machinery and upon the tunnel of the property by which the latter has been extracting and bringing out ore from its own deposits located between the Forest of Dean holdings. This renewal will extend for 20 months. Mr. Kemmerer controls the Carbon Iron & Steel Co., operating the Carbon blast furnace at Parryville, Pa.

Basic Sold in East at Low Prices

Many Mills Will Be Idle for Unusually Long Periods During Holidays—Buyers More Interested in Making Contracts

BY C. J. STARK

Office of THE IRON TRADE REVIEW,
503-4 West St. Bldg.,
New York, Dec. 23.

Iron Ore.—Cuban ore shipments for 1913 of the Spanish-American Iron Co., the leading operator in that country, will reach about 1,025,000 tons, the largest figure in history. This is an increase of more than 100,000 tons over last year. Advices have been received in this country that a Welsh consumer has offered to take 50,000 tons of Algerian ore at a price which will net the seller 20 cents a ton more than was realized from the sales of this material to this country the past half year. The incident is accepted as indicating a better demand abroad for rich hematites at prices which will preclude the marketing of much of this ore in this country. Eastern ore consumers remain wholly indifferent to making forward purchases.

Pig Iron.—The number of buyers who entertain the belief that present prices of iron offer unusual bargains, seems to be increasing. Under the surface, there continues a much greater stir among prospective purchasers, who, in the main, are not putting out general inquiries, but are quietly casting about to find the lowest figures available. As there are several aggressive sellers in the field, the aggregate tonnage being closed in this and surrounding districts, as result of these negotiations, is considerable, and price concessions have been quite general. Certain eastern Pennsylvania foundry brands have developed unusually low prices, one maker there quoting No. 1X for New Jersey delivery, around $14.50, delivered, and $14.25, delivered, has appeared on No. 2 plain. These prices figure about $13.35 to $13.70, furnace. Buffalo iron, despite occasional reports of lower being done, is holding at about $12.75 to $13, furnace, for No. 2X, covering both prompt and forward delivery. Considerable additional Buffalo iron was sold in the metropolitan and New England districts in the week at about these prices. A soil pipe maker is inquiring for 5,000 tons of low grade iron for delivery to plants in this district and up state. A Troy consumer is understood to have placed 1,000 tons of special foundry iron with a New York state furnace. The American Tube & Stamping Co., Bridgeport, Conn., purchased 6,000 tons of first quarter basic from an eastern maker at about $14.70, delivered. An active demand for low phosphorus iron continues, which includes 1,000 tons and other lots for this district, about 1,200 tons for Buffalo, 600 tons for Pittsburgh, 600 tons for Milwaukee and several thousand tons for Chicago. A New York state steel foundry, just outside the metropolis, is reported to have closed for several thousand tons of low phosphorus with an eastern maker. Several of the largest New England buyers of malleable are sounding the market.

Leading makers of southern iron report largely increased inquiry during the past few days, principally for forward shipment.

Ferro-Alloys.—The United States Steel Corporation, it is understood is in the market for 5,000 tons or more of 50 per cent ferro-silicon. This buyer usually comes out at this period of the year for this alloy. Prices for 50 per cent ferro-silicon for next year have not yet been announced. Ferromanganese sales remain small. Some carload lots taken at $47, seaboard, are noted. There are still some reports in the market that this price is being shaded on small lots of resale material.

Plates.—The city of Ottawa will take bids Feb. 3 on 85 miles of 51 to 58-inch riveted steel pipe, which it is estimated will require from 150,000 to 175,000 tons of plates. The inquiry calls for 42 miles of 54-inch pipe, 32 miles of 58-inch pipe and 11 miles of 51-inch pipe. Deliveries are to extend over two and a half years. Makers in the United States, it is believed, stand a good chance of obtaining the steel for this unusually large project. Leading equipment makers confirm the statement that they have been unable to shade 1.20c, Pittsburgh, on car material for forward delivery with the larger makers from whom they generally receive their supplies. For early delivery on limited tonnages, 1.15c, Pittsburgh, could probably be done with certain mills by buyers of this very large class.

Structural Material.—Some reports are current that 1.15c, Pittsburgh, equivalent to 1.31c, New York, has been done on attractive specifications of shapes for early delivery by nearby mills. Such quotations, however, are unusual and the minimum of the market generally is 1.20c, Pittsburgh, with from that level up to 1.25c, Pittsburgh, asked on forward shipment. New business continues slow, but some interests observe better prospects and look for an improvement as spring approaches.

Leading makers of steel bars announce that they are holding firmly 1.25c, Pittsburgh, for first quarter contracts. Some other makers, however, it is understood will do 1.20c, Pittsburgh. Consumers generally show more willingness to contract and orders for current rollings are small.

Coke.—The McIntyre Iron Co. has closed for 7,000 to 8,000 tons monthly of standard Connellsville coke for first half delivery at $2, ovens. This fuel is to be used by the Port Henry furnace in the experiments with titaniferous iron ores, which are to be conducted by the company for a period of six months, beginning Jan. 1. As previously reported, this furnace has been leased by the McIntyre Iron Co. especially for these tests. Another eastern consumer is inquiring for 10,000 tons of furnace coke for early delivery.

Cast Iron Pipe.—The Union Gas Co., Brooklyn, has begun to sound the market on forward requirements of pipe, aggregating 5,000 to 6,000 tons. The action of this buyer is taken to indicate some private consumers are becoming more attentive to the profitable opportunities shown by ruling prices. F. A. Houdlette, Boston, is the low bidder on 250 tons of various sizes for Medford, Mass., at $23.10, delivered. The tonnage required for Schenectady, N. Y., was much exaggerated in earlier reports and amounts to but 1,500 tons of 36-inch. This city also is taking blds on steel pipe. Prices in cast iron pipe have reached the stage where concessions are less readily obtained.

Old Material.—With eastern iron and steel works generally shut down for the rest of the week or longer, the scrap market is in a lifeless state. A slight improvement in orders was noted during the week preceding and two eastern works bought heavy steel at $10, delivered, which is an almost unprecedented price.

The sintering plant of the National Tube Co. at Lorain, O., has been started in operation, to make use of the flue dust from blast furnaces.

The Grant Iron & Metal Co., Detroit, advises it has installed a 15-ton industrial locomotive crane and magnet.

STRONG SENTIMENT

In Favor of Requiring Gradual Retirement of Wooden Cars.

Washington, Dec. 23.—In view of the pending bill in the house, introduced by Congressman Stevens, of New Hampshire, asking that the Interstate Commerce Commission be empowered to control the physical operation of the railroads of the country, the twenty-seventh annual report of the commission, issued last Friday, recommending that it be given that authority, is of added interest. It points to a fight in this direction being made at the present session of congress. There is no doubt that a strong sentiment favoring such legislation is prevalent.

Hearings on Mr. Stevens' bill will be taken up in the forepart of January. It is wide in its scope, and among other things recommends the replacement of wooden cars, in a reasonable time, with steel cars, and the determination of the time for this, along with the inspection of steel rails, and other equipment, would rest with the commission. Mr. Stevens is chairman of the sub- committee of the house interstate, foreign and commerce committee, having this sort of legislation in charge. Last week, the subcommittee sat at a hearing on a bill of Congressman Roberts, of Massachusetts, requiring the railroads of the country to supplant wooden cars with steel cars within four years.

It was generally conceded that the time limit was too short and that the railroads should not be compelled to discard any serviceable wooden cars. Mr. Roberts said he did not care to be arbitrary as to such a requirement and expressed a willingness to allow the Interstate Commerce Commission to determine a time limit. Its opinion regarding this is expressed in its report. It was stated at the hearing that railroads of the country claim it would cost $600,000,000 to replace wooden cars now in service with steel cars. Electric interurban and street railways doing interstate business contend such a requirement would put them out of business and the Electric Railway Association, operating throughout the country, as well as Indiana and Ohio interests, will be heard on this question. It is understood it will actually be attempted to show a wooden trolley car is safer than one of steel.

In its report, the Interstate Commerce Commission says, regarding steel equipment replacing wooden cars:

"Reasonable time should be given the carriers for compliance with the provisions of any law of this kind, and its application in the first instance should be confined to important high-speed trains. There are a great number of wooden cars now in service, and the carriers should be permitted to make use of these cars on branch lines and in local service until they can be replaced by steel equipment, but the law should provide that all new cars constructed after a certain date should be made entirely of steel or steel underframe construction of approved design."

"There is particular need," the commission says, "for an investigation of the conditions surrounding the use of steel rails and car wheels upon railroads."

Reference is made to investigations which have emphasized the need of information pertaining to track and rail conditions with respect to the vastly increased wheel loads consequent upon the use of heavier locomotives and cars and higher rates of speed.

Dealing with inspection of locomotive boilers, it is stated that the report of the chief inspector shows a marked decrease in the number of casualties due to failure of locomotive boilers and their appurtenances and a substantial improvement in the condition of such equipment.

Operating on a Winter Basis

Operations at Ferdinand Schlesinger's Newport mine at Ironwood, the biggest producer on the Gogebic range, have been put on the customary winter basis. While the services of 300 men have been dispensed with, the force still comprises 900 men. The crews will be enlarged again in the spring. All breaking down of ore is now being accomplished by the day shift, the timbering and repair work being done at night. Pending the completion of the engine house and the installation of its equipment, shaft-sinking at the Cleveland-Cliffs Iron Co.'s new Athens mine at Negaunee, Marquette range, is suspended.

L. C. Young, of the McDowell Foundry Co., was elected president at the annual meeting of the Chicago Foundrymen's Club, held recently at the Hotel Sherman. H. S. Vrooman was chosen vice president, and C. E. Hoyt was re-elected secretary-treasurer. Four new directors were elected, including James Wood, of the Sheffield Foundry Co.; O. J. Abell, of the *Iron Age;* George Carlin, of the Elevator Supply Co., and Wm. Dank, of H. W. Caldwell & Son Co. The new directors succeed A. M. Thompson, E. W. Smith, E. J. Welch and Wm. Pederson. The full board of directors is, therefore, now as follows: E. F. Axner, J. G. Garrard, C. B Carter, H. Cole Estep, James Wood, O. J. Abell, George Carlin and Wm. Dank.

Decision on Scrap Rates

Washington, Dec. 23.—Rates on scrap iron between Milwaukee and Chicago, which the C., M. & St. P. proposed to increase from 50c to 70c per gross ton, will be 3c per 100 pounds beginning with March 1, 1914, and prevailing for two years. An opinion to this effect was handed down by the Interstate Commerce Commission last Saturday.

It was held that the 70c rate was not justified, but that an increase to 3c per 100 pounds would be a just and reasonable maximum. The decision referred to the recent increase in scrap iron rates between Duluth, Minn., and Chicago, which the commission permitted, the St. Paul-Chicago rate advancing from 8c to 10c per 100 pounds. The opinion of last Saturday was partly based on the Duluth-Chicago case.

Heads Pig Iron Society

Stanton S. Freeman, general manager of the Carbon Iron & Steel Co., operating the Carbon furnace at Parryville, Pa., has been elected president of the Eastern Pig Iron Association for the ensuing year. He succeeds Robert E. Brooke, of the E. & G. Brooke Iron Co., Birdsboro, Pa., who served in this capacity during the past year.

Mr. Freeman is one of the leading furnace operators of the east. His management of the Carbon furnace has been marked with signal success. He is 39 years of age and is a native of Columbus, O. His advanced education was obtained at the Ohio State University of the class of 1898, when he took his degree of mining engineer.

W. S. Pilling, of Pilling & Crane, Philadelphia, continues in the post of secretary of the Eastern Pig Iron Association, which he has occupied for some years past.

George J. Siedler has resigned as sales manager of the Taylor-Wharton Iron & Steel Co., of High Bridge, N. J., to become vice president of the Eynon-Evans Mfg. Co., of Philadelphia, on Jan. 1, 1914. W. S. Stothoff succeeds Mr. Siedler as sales manager of the Taylor-Wharton Iron & Steel Co.

Corporation Will Sell Ferro-Manganese

Competing With German and English Makers—Sales Made at $2 Under Price Made by Foreign Furnaces

New York, Dec. 24. (By wire.)—The United States Steel Corporation has entered the domestic market as a permanent seller of ferro-manganese in competition with German and English makers who have supplied most of the requirements to steel makers of this country in recent years. In announcing its new policy the Steel Corporation through high officials states that it intends to do merchant business in this product. It hopes to be able to supply the bulk of the material purchased by other steel makers of this country. Already one sale of 1,500 tons and another of 1,000 tons have been made to domestic buyers. While no official statement is made of the price at which the Corporation is selling, it is understood to have offered ferro-manganese on the basis equivalent to about $45, seaboard, which is $2 a ton below the official English and German price.

The Steel Corporation has been operating furnaces for the production of ferro-manganese in Pittsburgh, South Chicago and Ensley for some years, but has used the output for its own operations. On rare occasions it has furnished other steel makers through private arrangement, but it has never been a regular seller before. While the present capacity for manufacturing this alloy is large, it will undoubtedly have to put more furnaces on the production, since the consumption of ferro in this country in recent years outside of the Steel Corporation has been about 100,000 tons annually. The manganese ore from which the Corporation makes ferro-manganese is imported from India, Russia and Brazil. Foreign makers have not yet indicated what step they will take to meet the new policy, but it is expected that they will compete vigorously.

Many Returning.—The management of the Calumet & Hecla Co. has issued a statement that the striking copper miners who do not return to work before Jan. 1 will not be taken back after that date. Other men, it is stated, will be brought in from the outside to fill their places. During the past two weeks conditions in the Lake Superior copper region have been quiet. Hundreds of men are returning to work and rock shipments are increasing daily. It is evident that the strike has been lost by the Western Federation of Miners.

Affirms Decision

New York, Dec. 20.—A judgment returned Dec. 18 by the United States circuit court of appeals, at New York City, affirms the decision of the manufacturers against labor unions in the celebrated Danbury hatter's boycotting case, which has been in the federal courts since 1903. The court of appeals reawarded the judgment of $252,130 returned by the federal district court of Connecticut about a year ago, to D. Loewe & Co., Danbury, Conn., independent manufacturers of hats, in their damage suit against the United Hatters of North America, Martin Lawlor and other members of that organization, under the Sherman anti-trust act. The Loewe company suit was aimed to recover from the hatters' union the damages sustained from a boycott which it was alleged was started and carried out with the purpose of injuring the company's business because of its refusal to employ only union men.

Judge Coxe, in a written opinion, says that the applicability of the Sherman law to the acts of the hatters' union in this case is no longer debatable. "No one disputes that labor unions are lawful," he says. "All admit that they are not only lawful but highly beneficial when legally and fairly conducted, but like all other combinations, irrespective of their object and purposes, they must obey the law." It is believed that another appeal now will be taken to the highest courts of the country on behalf of the defendants.

The Otis Steel Co. has taken out permits for seven additional buildings at the site of the plant being erected in Cleveland. The sizes and estimated cost are as follows: Boiler house, one story, 50 x 100 feet, $6,500; machine shop, one story, 100 x 100 feet, $10,000; producer and boiler house, one story, $48,000; pump house, one story, $31,000; storehouse, two stories, $9,000; power house, one story, $75,000; mill, one story, $210,000.

Obituaries

Walter L. Heady, aged 46, Cleveland, manager of the Best Mfg. Co., is dead of peritonitis.

Michael Garland, aged 75 years, manufacturer of mill machinery at Bay City, Mich., is dead after a long illness.

Ira P. Carnes, Lima, O., founder and president of the Lima Locomotive Works, is dead from a stroke of apoplexy.

Michael J. Scheel, aged 53, Cleveland, manager of the ornamental iron department of the W. S. Tyler Co., is dead of heart failure. He had been with the Tyler company since 1870.

Herbert Gardner, salesman for the American Steel & Wire Co. in eastern Pennsylvania, died of kidney trouble at the German hospital, New York City, Dec. 21, aged 39 years. He had been connected with the company for 15 years. His home was in Orange, N. J.

Hoyt H. Green, president of the Green Car Wheel Co., 3018 North Broadway, St. Louis, died at the home of his daughter, Mrs. Harry Hayes, in Cleveland, Tuesday, Dec. 17, at the age of 77 years. Mr. Green retired from active business when his health began to fail about two years ago, but retained control of the car wheel company. He also was president of the American Hardwood Lumber Co. and vice president of the Williams Patent Crusher & Pulverizing Co. The body was taken to St. Louis for burial.

Large Forces Employed

The largest forces in the history of the properties are employed at the Cleveland-Cliffs Iron Co.'s Negaunee and Maas mines at Negaunee, Marquette range, approximately 100 names having been added to the payrolls since the first of December. Nearly 600 men are at work at the Negaunee and nearly 300 at the Maas. It is expected that further additions will be made as underground development advances. Each mine is being operated on two eight-hour shifts.

The National Foundry, Mfg. & Supply Co., Williamsport, Pa., has increased its capital stock from $100,000 to $150,000.

TRACK MATERIAL

Is a Very Important Factor in Railroad Buying of Week.

Many of the railroads continue in the market for their first quarter and first half requirements of track material of miscellaneous character. The Chesapeake & Ohio has placed 2,500 kegs of spikes, of which 1,000 kegs went to the Tredegar Co., 1,000 kegs to the Jones & Laughlin Steel Co. and 500 kegs to the Illinois Steel Co. The Virginian railway has ordered 1,500 kegs of the Jones & Laughlin Steel Co. The Seaboard Air Line still has open an inquiry for 12,000 to 15,000 kegs for first half and a number of other roads are in the market. The standard spike prices show irregularity. Prices of 1.45c, Pittsburgh, are now quite freely named and lower is reported. The Norfolk & Southern and the Southern railroad are inquiring for their first half bolt requirements, about 500,000 each, and a number of other roads also are figuring upon their needs of this material. The Delaware & Hudson is inquiring for 3,000 tons of light rails and there is an unconfirmed report that it is in the market for a round tonnage of standard sections. The New York Municipal Railways Corporation has issued an inquiry for bids Jan. 5 for another elevated section in Brooklyn, estimated to require 13,500 tons.

Bids are going in on the Union Pacific car inquiry and it is expected that some very low prices will be made. This order will call for about 50,000 tons of steel. In general, the equipment market in the west is quiet and most of the car building and railway supply shops will be closed down from 10 days to two weeks over the holidays. An inquiry for 23,000 tons of rails has developed at Chicago.

CAR ORDERS AND INQUIRIES.

The Illinois Central is in the market for 150 refrigerator cars.

The Louisville & Nashville has ordered 18 all-steel passenger cars from the American Car & Foundry Co.

The Northwestern Pacific Railway Co., of San Francisco, is in the market for four passenger and two freight locomotives.

CAR AND LOCOMOTIVE ORDERS.

The New York, Ontario & Western has ordered 12 steel coaches from the American Car & Foundry Co.

The Erie railroad has placed seven postal cars with the Standard Steel Car Co.

BRIDGE AND STRUCTURAL WORK.

Elevated railroad section, Liberty avenue, Brooklyn, for New York Municipal Railways Corporation, estimated to require about 13,500 tons. Bids to be received Jan. 5.

Lehigh Valley railroad 400 tons bridge work. Award lies between Pennsylvania Steel Co. and the American Bridge Co.

Office building for Delaware & Hudson railroad, Albany, N. Y., 1,000 tons. Bids to be entered Dec. 29.

STRUCTURAL CONTRACTS

Are Few, But Improved Business Early in 1914 is Expected.

In eastern territory and in fact throughout the country, few contracts for structural material are being placed, but improvement is expected early in the new year.

The Carnegie Steel Co. booked 5,000 tons of reinforcing bars in New York, 2,500 tons for a warehouse for the Austin-Nichols Co., Brooklyn, and 2,500 tons for another building in the same city.

Interest in building requirements in the immediate Chicago district has been revived by the placing of two contracts aggregating 3,800 tons. It is probable also that a project will soon be financed for the new Stratford hotel at the corner of Michigan avenue and Jackson boulevard, which will require about 4,000 tons of shapes. Property owners undoubtedly realize that steel prices are very favorable at present and should credit become any easier, a considerable volume of construction may be looked for in the west.

CONTRACTS PLACED.

Minneapolis Athletic Club building, Minneapolis, Minn., 469 tons to the Kenwood Bridge Co.

Crane Co.'s shops, Chicago, 2,300 tons to Vierling Steel Co. and South Halsted Street Iron Works.

Addition to Kaiserhof Hotel, Chicago, 1,500 tons to the American Bridge Co.

New plant for Knickerbocker Ice Co., Broome and Elizabeth streets, New York City, 700 tons, awarded to Hinkle Iron Works.

Jacobs apartment, West Seventieth street, New York City, 600 tons awarded to the Belmont Iron Works.

High school, Willimantic, Conn., 300 tons, placed with Berlin Construction Co.

Factory building, the Boldt Co., of Huntington, W. Va., 1,000 tons to the Mt. Vernon Bridge Co.

CONTRACTS PENDING.

Levy apartments, Seventy-second street and Lexington avenue, New York City, 700 to 800 tons. Bids asked.

Public School No. 56, Bronx, New York City, about 250 tons. Bids asked.

Hospital, Rockaway Beach, N. Y., about 300 tons. Bids asked.

Emergency hospital, Washington, D. C., Wells Bros. awarded general contract.

Chronicle building, Augusta, Ga., 500 tons, general contract awarded to the King Lumber Co., Charlottesville, Va.

Central high school, Washington, original bids rejected and two separate buildings now planned. Originally figured to require 900 tons.

SLIGHT ADVANCE

Made in Prices of Middlesbrough Iron —Stocks Are Reduced.

New York, Dec. 23.—Slight price advances in hematite have been posted by English makers in the Middlesbrough district as the result of the recent improved demand for this grade, especially from Germany and the continent, according to cable advices received in this city.

Stock conditions in the Middlesbrough district remain very favorable. A further reduction of 4,795 tons was shown by the week ending Dec. 11, which brings the total decline in the year to date to 97,823 tons. Total stocks on Dec. 11 were 143,800 tons. On Dec. 12, 1912, they were 247,548 tons. Cumberland district stocks showed no change whatever in the week ending Dec. 11, and remain at 9,068 tons.

In the Middlesbrough district, 76 furnaces were blowing Dec. 11, a loss of one from the preceding week. On the corresponding date a year ago, 64 furnaces were active. Operations in the Cumberland district stood at 24 furnaces, an unchanged figure. One year prior, 15 furnaces were blowing. A similar condition is shown in Scotland, where the active list remained unchanged at 76 furnaces, compared with 90 furnaces on the corresponding date in 1912.

A summary of the stock conditions in the Middlesbrough and Cumberland districts in recent weeks with the number of furnaces blowing shows the following:

MIDDLESBROUGH DISTRICT.

	Stocks.	Furnaces.
Dec. 11	143,800	76
Dec. 4	148,595	77
Nov. 27	150,599	79
Nov. 20	151,233	79
Nov. 13	152,372	81
Nov. 6	156,415	81
Oct. 30	158,281	81
Oct. 23	164,837	81
Oct. 16	167,099	81
Oct. 9	168,474	81
Oct. 2	170,848	81
Sep. 25	171,887	83
Sep. 18	175,803	85
Sep. 11	179,360	88
Sep. 4	183,140	89
Aug. 28	187,269	..
Jan. 1	241,623	..

CUMBERLAND DISTRICT.

	Stocks.	Furnaces.
Dec. 11	9,068	24
Dec. 4	9,068	24
Nov. 27	10,341	24
Nov. 20	10,891	24
Nov. 13	11,131	24
Nov. 6	11,240	24
Oct. 30	12,025	26
Oct. 23	12,889	26
Oct. 16	13,189	26
Oct. 9	13,899	26
Oct. 2	16,968	25
Sep. 25	17,720	25
Sep. 18	18,181	24
Sep. 11	18,829	24
Sep. 4	19,601	24
Aug. 28	19,761	..
Jan. 1	36,423	..

IRON MINING NEWS

Marquette Made Headquarters

Marquette, Mich., will hereafter be the headquarters of the general manager and the purchasing agent of the Lake Superior Iron & Chemical Co. George J. Webster is the new general manager, recently appointed to succeed W. H. Mathews, resigned. G. E. Dow, formerly superintendent of the Woods operations, resigned several weeks ago. The department of which he was the head has been abolished and its operations will be under the direction of the general manager. L. F. Knowles, the secretary, has also resigned, his resignation to take effect Jan. 1, and this office has also been abolished. The changes, it is announced, have been made in the interest of economy and are part of the plan contemplated when the recent organization was brought about.

Searching for Ore

Under the direction of Captain Thomas Walters, of Ishpeming, Mich., general manager of the mining department, the Jones & Laughlin Steel Co., of Pittsburgh, is making an energetic search for ore in the Lake Superior iron country. For many years one of the principal operators in the region, and with a production record of many million tons, it is actively engaged in the task of strengthening its reserves. The company's latest expansion has been in the acquisition of the Thomas Feigh lands adjoining the Tod-Stambaugh Co.'s Pennington mine in the new Cuyuna district. Drilling has shown the tract to contain several million tons of ore.

While a pioneer on the Marquette range, where the Lake Angeline property at Ishpeming was opened in 1864, the Jones & Laughlin company is chiefly interested on the Mesabi. Its shipping mines in that field this season were the Grant, Lincoln, Longyear, Leetonia, Fowler and Meadow, the combined outgo from which approximated 1,700,000 tons.. It is believed the Jones & Laughlin company will open several mines in the Grand Rapids country. The work in progress now is of a preliminary nature. Much interest attaches to the innovation of employing a hydraulic dredge or excavator in removing overburden. The process has been thoroughly tested within recent weeks and so far as can now be judged, it appears the method is wholly practical. The dredge—named the John B., in honor of John Beckfelt, of Grand Rapids, discoverer of much of the ore in the region—is designed to remove the overburden by washing it away. A grinder at the front of the barge is revolved by twin Corliss engines, and as the detached refuse drops down, it is taken up by powerful suction pumps and forced through conveyor pipes to any required distance. These pipes are laid along pontoons which may be swung into any position on the stream along which the work is being done, enabling the residue to be deposited as far from the scene of actual operation as may be necessary. The process was submitted to a particularly severe test when the discharge end of the conveyor pipe was placed at an elevation of 60 feet from the intake and the flow obstructed by two right angles and two angles of 45 degrees. The pumps forced the sand and dirt through the lines satisfactorily. It is considered as a result of this experiment, that there will be no trouble in removing the entire overburden, although it will be necessary in some places to go down to a depth of 100 feet.

On the Marquette range the Jones & Laughlin company has started shaft-sinking on its new Iron Mountain Lake property, a mile east of the Lake Angeline mine, where diamond drilling operations had been in progress for the past four years. The shaft will be sunk at a rapid rate. Three crews, working in eight-hour shifts, are employed. A temporary engine house and boiler house have been erected and equipped. Permanent machinery will not be needed for nearly a year, as it will take that length of time to sink the shaft to the point where the first drifts to the ore body will be started. The shaft will be 10 by 12 feet in dimensions. The ledge is only six feet beneath the surface. The shaft will be timbered. The Jones & Laughlin company has a fine property in the Rolling Mill mine at Negaunee, Marquette range, and in the Iron River district of the Menominee it is opening the Forbes. A second shaft is being sunk on the latter tract. While it has been necessary lately to reduce the working force at the Lake Angeline mine somewhat, due to the exhaustion of some of the stopes, the men effected have been given work at the Iron Mountain Lake, Rolling Mill and Forbes properties. On the Mesabi range the company is preparing to develop the Columbia mine, within the city limits at Virginia. The property will be an open-pit producer. Stripping operations will be started in the spring. The work will require two years. It is estimated the Columbia contains 5,000,000 tons of ore. It has been necessary to close streets and remove buildings to permit the removal of the overburden.

Electric Plant for Kennedy Mine

The Kennedy mine of the Rogers, Brown Ore Co. has finished the installation of electrical equipment for the generation of its power. A 5-ton Goodman electric locomotive is used underground and hauls a string of ten 3-ton cars from the workings to the shaft where the ore is dumped into pockets. On the surface the ore is hauled by a 3-ton General Electric locomotive, 3-ton cars being used. Where formerly 20 trammers and others were used, the work is now being done as satisfactorily by only six men.

Dale & Bumgardner, of St. Paul, have the contract building the Northern Pacific railway extensiion along the south shore of Rabbit lake to the timber shaft of the Kennedy mine at Cuyuna. The Cuyuna-Mille Lacs mine has been bothered by water on the lower level. New pumps will soon be provided. Mining continues uninterrupted on the upper level. The Duluth-Brainerd mine is down six feet in the shaft ledge in section 32, township 47, range 29. The Cuyuna-Duluth mine at Ironton is increasing the depth of its shaft and also getting out a stockpile. The Adbar Development Co. has a drill at work at Phillbrook. The Rowe pit mine at Riverton has its hydraulic plant, a steam shovel and two trains of dump cars in operation. The Inland Steel Co. Thompson pit mine is working a steam shovel. The Barrows mine at Barrows is sinking a five-compartment shaft and is down 60 feet. The Brainerd-Cuyuna mine in Brainerd has its steam plant in operation and is down 60 feet. Ledge in the shaft is

only 100 feet from the surface, the ground being hardpan. The city of Brainerd and county of Crow Wing are advertising for bids to develop on a royalty basis their mineral land holdings. The Cuyuna Iron & Manganese Ore Co. is about to convert its holdings in section 10, township 46, range 29 into a pit mine. It borders on the Pennington.

Mining Operations Curtailed

A curtailment of mining operations more extensive than usual at the close of interlake navigation has taken place in the Lake Superior iron region. The contrast exists, however, only because of the unprecedented production attained during the year. There are employed, it is believed, approximately as many men as at this time in 1912. Working forces had been greatly increased in the spring and there was exceptional activity while shipments were in progress, the result of which was the record-breaking outgo of about 50,000,000 tons of ore. There have been retrenchments this fall on all the old ranges, yet a survey of the situation indicates that only on the Mesaba is the volume of work materially less than was the case 12 months ago at this date, and this recession is largely offset by the increased activity in the new Cuyuna district, just as the suspensions and curtailments at the various mines in the other fields practically equalized by the development work at newer properties.

Crystal Falls District

The men at work in the Crystal Falls district of the Menominee constitute fully as large a force in the aggregate as a year ago. The only recent suspensions have been at the McDonald mine, a small property controlled by the Erie ore interests and now wholly closed, and in the operations of Pickands, Mather & Co. in the Amasa field. The Tobin mine of Corrigan, McKinney & Co was put on the inactive list early in the year. Offsetting these retrenchments, M. A. Hanna & Co. are employing good-sized forces in the development of the Carpenter and Revenna properties, two of the largest on the range, and the operations of the Longyear interests and Pickands, Mather & Co. in the Mastodon field are steadily expanding.

The Sterling Steel Foundry, Pittsburgh, has increased its capital stock from $293,000 to $313,000.

Apallo Steel Co.'s Electrically-Driven Sheet Mill

The new plant of the Apollo Steel Co., Apollo, Pa., which began operations on June 16, embodies several features new to the sheet steel industry. The sheet mills are electrically-driven. The roll drive consists of a 1,400 horsepower motor, operating at a speed of 240 revolutions per minute, two flywheels and gear set transmitting the power to the mill shaft at approximately 30 revolutions. The largest gear is 19 feet, 7½ inches in diameter, has a 42-inch face with helical cut teeth, and is driven by a 30-inch diameter pinion. The two flywheels, which weigh about 23 tons each, are keyed to a shaft which is direct-connected to the motor by an Oldham coupling of improved design, so that wear can readily be taken up. The connection also permits the removal of either the motor or pinion shafts and flywheels independently. The drive bearings are lubricated by the gravity system.

The train of rolls consists of six sets of finishing rolls, four sets of roughing rolls and two sets of cold rolls, all of the equipment being of unusually heavy design.

The heating furnaces are of the Bailey combination type, stoker-fired. The pair furnaces are tandem to the sheet furnaces and are charged and drawn from each side. Bars are heated by radiation instead of by direct flame. The annealing furnaces are of the Hagan stoker-fired type, there being two double furnaces, giving four compartments. All the furnaces are operated by American underfeed stokers of the ratchet drive type, air being admitted under pressure. No free air is admitted, thus preventing scaling. The galvanizing department is equipped with two pots and necessary pickling and washing tanks.

The Mill Building

The mill building is of depressed bay construction, 504 feet long and 156 feet wide. It is equipped with three Northern Engineering Co. cranes, one of 30 tons capacity with a 10-ton auxiliary hoist, the others of 10 tons capacity. Feed lines for carrying the electric current along the crane runway are standard steel rails, making a safer construction than the copper wires ordinarily used. All crane gears are guarded, while the track wheels have guards that make it impossible to run over any obstructions on the tracks.

Electric power for the plant is furnished by the West Penn Electric Co. on a transmission line from its hydro-electric plant at Connellsville, Pa., and is run through a sub-station which also can be connected with the transmission line from the electric company's Creighton, Pa., power plant. The current enters the mill sub-station at a pressure of 25,000 volts, three-phase, 60 cycles, and is stepped-down to 2,300 and 220 volts. The 2,300 volts are conducted to the motor driving the rolls through an underground fiber conduit. The smaller voltage is used for the cranes, lights and small motors. All wiring is in steel conduits. The plant is brilliantly illuminated, 500-watt Mazda lamps provided with white enameled steel shades being spaced 24 feet apart throughout the mill.

The plant has an annual output of about 30,000 tons of black, galvanized and corrugated sheets, Nos. 10 to 30 gage.

Robert Lock is president and manager, A. M. Oppenheimer vice president and Charles P. Wolfe, secretary and treasurer. Sales offices have been established at 702 Betz building, Philadelphia; 1114 Citizens building, Cleveland; Ogden building, Chicago, and 331 West Main street, Louisville. The Pittsburgh district is covered by the main office at Apollo.

Starts Work on Coke Plant

Grading has been started on the site of the $2,000,000 coke ovens plant that the Laclede Gas Light Co. will build on a 200-acre tract between South Broadway and the Mississippi River, Klausmann's Grove and Jefferson Barracks, St. Louis. Charles L. Holman, president of the Laclede Gas Light Co., says the work of erecting the plant will be pushed as rapidly as possible. The plant will cover about 40 acres. It will have 56 ovens, with a daily producing capacity of 750 tons. The coke will be made from Pennsylvania bituminous coal brought to St. Louis on barges by way of the Ohio and Mississippi rivers.

Corrigan, McKinney & Co., of Cleveland, have awarded contract for all the scales for their new steel plant in the upper reaches of the Cuyahoga river at Cleveland to Fairbanks, Morse & Co., of Chicago.

The Charles City Engine Co., Charles City, Ia., has bought the entire plant and equipment of the Novelty Iron Works, of Dubuque, Ia. The business will be removed to Charles City.

IRON AND STEEL PRICES

Pig Iron

PITTSBURGH

(Through This Year and First Half 1914.)

Bessemer	$15.90
Basic	13.65
No. 2 foundry	14.15 to 14.40
Malleable	14.15 to 14.40
Gray forge	13.90

(The freight from valley points is 90c.)

CLEVELAND

(Through First Half 1914, Delivered in City.)

No. 1 foundry	$14.25 to 14.75
No. 2 foundry	13.75 to 14.25
No. 2 southern	13.35
Bessemer	15.90
Silveries, 8 per cent silicon	18.55

CINCINNATI

(Prompt and First Half.)

Southern foundry No. 1	$14.25 to 14.75
Southern foundry No. 2	13.75 to 14.25
Southern foundry No. 3	13.25 to 13.75
Southern foundry No. 4	13.00 to 13.50
Southern gray forge	12.75 to 13.25
Mottled	12.75 to 13.00
Southern No. 1 soft	14.50 to 15.00
Southern No. 2 soft	14.00 to 14.50
Southern Ohio No. 2	14.20 to 14.70
Southern Ohio No. 3	13.70 to 14.20
Southern Ohio No. 4	13.45 to 13.95
Silveries, 8 per cent silicon	17.70 to 18.20

(Freight from Ironton, $1.20; from Birmingham, $3.25.)

CHICAGO

(Delivered Chicago, until July 1, 1914, except northern foundry and malleable Bessemer, which are quoted f. o. b. local furnace.)

Lake Superior char., No. 1 to 4	$15.50
Northern foundry No. 2	14.25
Southern foundry No. 2	15.35
Jackson Co. silveries, 8 per cent	19.40
South'n silveries, 5 per cent sil.	16.85
Alabama basic	15.35
Malleable	14.25

PHILADELPHIA

(Prompt and first half shipment delivered to consumer's plants in Philadelphia and vicinity, unless otherwise specified.)

Northern No. 1X foundry	$15.50 to 15.75
Northern No. 2X foundry	15.00 to 15.50
Northern No. 2 plain	14.75 to 15.00
Standard forge (Eastern Pa.)	14.50 to 14.75
Virginia No. 2	15.80
Southern No. 2	15.00 to 15.50
Standard low phos., Phila.	20.75 to 21.50
Lebanon low phos., furnace	17.50 to 18.00
Malleable	15.00 to 15.50
Basic (Eastern and Central Pa.)	15.00
Middlesbrough, English No. 3 (on dock)	14.25 to 14.50

NEW YORK

(Prompt and first half delivery, prices based at Jersey City and at Jersey points near tidewater.)

Northern No. 1X foundry	$15.25 to 15.50
Northern No. 2X foundry	14.75 to 15.25
Northern No. 2 plain	14.50 to 14.75
Virginia No. 2X	15.80
Southern No. 2	14.75 to 15.25
Malleable	14.50 to 15.00
Gray forge	14.25 to 14.50

ST. LOUIS

(Throughout This Year.)

Southern No. 1	$15.25 to 15.75
Southern No. 2	14.75 to 15.25
Southern No. 3	14.25 to 14.75
Southern No. 4	13.75 to 14.25

(Freight, Birmingham to St. Louis, $3.75.)

BIRMINGHAM

(For Southern Delivery.)

No. 1 foundry	$11.50 to 12.00
No. 2 foundry	11.00 to 11.50
No. 3 foundry	10.75 to 11.00
No. 4 foundry	10.50 to 10.75
Gray forge	10.50 to 10.75
Mottled	10.25
Standard basic	11.00 to 11.50
Off basic	10.50 to 11.00
Charcoal	25.00

BUFFALO

(Delivered in city over remainder of year and first quarter of 1914.)

No. 1 foundry	$13.50
No. 2X foundry	13.25
No. 2 plain	13.00
No. 3 foundry	13.00
Gray forge	13.00
Malleable	13.00 to 13.25
Basic	13.25 to 13.50

Ferro Alloys

English 80 per cent ferro manganese, prompt and forward delivery, $47, seaboard.

Fifty per cent ferro-silicon on contracts, $75, Pittsburgh, or Philadelphia, for carloads; $74 for larger lots, and $73 for 600 tons or more. Twelve to 13 per cent, $23. Eleven to 12 per cent, $22. Ten to 11 per cent, $21. Nine to 10 per cent, $20, f. o. b. Globe, Jisco, and Ashland furnace. Freight to Pittsburgh, $1.90.

Ferro-carbon titanium 8 cents per pound for carload lots; 10 cents per pound for 2,000-pound lots and over; 12½ cents per pound in lots up to 2,000 pounds.

Freight rates on ferro-manganese, foreign spiegeleisen and electrolytic ferro-silicon from Baltimore to Pittsburgh, $2.16; to Youngstown, $2.48; to Cleveland, $2.57; to Detroit and Columbus, $2.99; to Cincinnati, $3.40; to Chicago and Milwaukee, $4.00. Freights from Philadelphia and New York, 10 to 30 cents higher, respectively.

Freight Rates, Finished Material

From Pittsburgh, carloads, per 100 pounds, to:—

New York	16 cents
Philadelphia	15 cents
Boston	18 cents
Buffalo	11 cents
Cleveland	10 cents
Cincinnati	15 cents
Chicago	18 cents
Denver	84½ cents
St. Louis	22½ cents
New Orleans	30 cents
Birmingham	45 cents
Pacific coast, shapes and plates	80 cents

Coke

AT THE OVENS.

	Prompt shipment.	Contract.
Connellsville district:		
Foundry coke	$2.50 to 2.75	$2.50 to 2.75
Furnace coke	1.70 to 1.85	1.85 to 2.00
Wise county district:—		
Foundry coke	$2.50 to 3.10	$2.65 to 3.10
Furnace coke	2.10 to 2.25	2.25 to 2.50
Pocahontas district:—		
Foundry coke	$2.50 to 3.00	$2.50 to 3.00
Furnace coke	2.00 to 2.40	2.15 to 2.60
New River district:—		
Foundry coke	$2.85 to 3.50	$2.85 to 3.50
Furnace coke	2.50 to 2.75	2.50 to 2.75

Iron Ore

On base ores with the guarantee of 55 per cent on old range and Mesabi Bessemer, and 51½ per cent on old range and Mesabi non-Bessemer prices are: Old range Bessemer, $4.40; Mesabi Bessemer, $4.15; old range non-Bessemer, $3.60; Mesabi non-Bessemer, $3.40; all at lower lake ports.

Foreign iron ores, 7½ to 8 cents per unit, f. o. b. cars eastern seaboard. Freight rates from Philadelphia to eastern Pennsylvania furnace points range from 35 to 75 cents per ton.

Semi-Finished Material

PITTSBURGH

Bessemer 4 x 4 billets with 0.25 carbon and less, $20.00; open-hearth rolling billets, $20.00; Bessemer sheet bars, $21.00; open-hearth sheet bars, $21.00, f. o. b. makers' mill. Forging billets, $24 to $25, Pittsburgh. Wire rods, $25.50; muck bar $29, Pittsburgh.

PHILADELPHIA

Delivered to consumers' plants in Philadelphia and vicinity: 4 x 4-inch open-hearth and Bessemer, rolling billets at $21.50 to $22.50, and forging billets at from $26.50 to $27.50; muck bar, $28.00 to $30.00.

Standard Shapes

PITTSBURGH

Standard structural shapes, 1.20c to 1.25c. For extras see card of Sept. 1, 1909.

CHICAGO

Standard structural shapes, 15 inch and under, 1.38c to 1.43c.

PHILADELPHIA

Standard structural shapes, base sizes, delivered to consumers' plants in Philadelphia and vicinity, 1.35c to 1.40c.

NEW YORK

Standard structural shapes, base sizes, delivered in metropolitan district, 1.36c to 1.41c.

Plates

PITTSBURGH

Standard steel plates ¼ inch thick, 6¾ to 100 inches, 1.15c to 1.20c. For extras, see card of Sept. 1, 1909.

CHICAGO

Tank plates, 1¼ inches thick, 6⅝ to 100 inches wide, 1.33c to 1.38c.

PHILADELPHIA

Tank plates, base sizes, delivered to consumers' plants in Philadelphia and vicinity, 1.35c to 1.40c.

NEW YORK

Tank plates, base sizes, delivered in the metropolitan district, 1.36c to 1.41c.

Sheets and Tin Plate

PITTSBURGH

No. 28 black	1.85c to 2.00c
No. 28 tin mill black	1.80c to 1.95c
No. 28 galvanized	2.85c to 3.00c
No. 10 blue annealed	1.35c to 1.45c
No. 28 painted corrugated	2.10c to 2.20c
No. 28 galvanized, corrugated	3.00c to 3.10c
Tin plate, 100-pound cokes	$3.40

PHILADELPHIA

Delivered to consumers' plants in Philadelphia and vicinity: No. 10 gage annealed sheets at 1.60c to 1.65c.

Pipe and Boiler Tubes

PITTSBURGH

	Black Butt-Weld.	Galv. Butt-Weld.
Steel, ¾ to 3 inches	80	71½
Iron, ¾ to 2½ inches	70	61
	Lap-Weld.	
Steel, 2½ to 4½ inches	79	70½
BOILER TUBES		
Steel, 3½ to 4½ inches	69	..
Iron, 3½ to 4½ inches	58	..

Other sizes of pipe and tubes take the usual advances as per official cards.

Rails and Track Material

PITTSBURGH

Steel rails, 50-pound and heavier, 1.25c per pound for Bessemer and 1.35c for open-hearth, carload lots; less than 500 tons, 1.35c per pound; light rails on base weight of 40 to 45 pounds, 1.25c, schedule on the other weights being irregular and subject to negotiations; angle bars for standard sections, 1.50c base, Pittsburgh; track bolts, 2.00c base, Pittsburgh.

Railroad spikes, 4½, 5 and 5½ and 9-16 inch, 1.50c to 1.55c.

CHICAGO

Light rails, carloads 25 to 45-pound, 1.25c; base; 16 to 20-pound, 1.30c; 12-pound, 1.35c; 8-pound, 1.40c.

Light section relayers, 45 pounds and under, subject to inspection, $21.50 to $22.50; standard section relaying rails, subject to inspection, $23 to $24.

Track fastenings, f. o. b. Chicago:

Angle bars, 1.50c; railroad spikes, 1.45c to 1.50c; smaller sizes spikes, 1.85c base; track bolts with square nuts, 2.10c to 2.20c.

Bars, Hoops and Bands

PITTSBURGH

Common iron bars, 1.40c, Pittsburgh; Bessemer and open-hearth steel bars, 1.20c; plow and cultivator, 1.20c; channels, angles, zees, tees, under 3 inch 1.30c, all f. o. b. mill.

Hoops in carload lots, 1.40c, Pittsburgh; in less than carload lots, 1.45c; bands, 1.20c base, with net extras as per standard steel.

Cold rolled and ground shafting, 63 to 65 per cent off in carloads and 58 per cent in less than carloads delivered in base territory.

CHICAGO

Bar iron, 1.12c to 1.20c; hard steel bars rerolled, 1.30c; soft steel bars, bands and small shapes, 1.33c to 1.38c; hoops, 1.53c; smooth finished machinery steel, 1 inch and larger, 1.68c; shafting, 65 per cent off list for carload lots, 60 per cent off for less than carloads.

PHILADELPHIA

Delivered in consumers' plants in Philadelphia and vicinity: Steel bars, 1.45c to 1.50c on contract and common bar iron, 1.25c to 1.35c. Cut nails, 1.80c to 1.90c, Philadelphia. Shafting, 62 and 60 off in carloads and 57 and 55 off in less than carloads in base territory.

NEW YORK

Soft steel bars delivered in the metropolitan district, 1.36c to 1.41c; common iron bars, 1.25c to 1.30c.

Bolts, Nuts and Rivets

Rivets

Button head structural rivets, 1.70c to 1.75c, Pittsburgh; cone head boiler rivets, 1.80c to 1.85c. Small rivets, 80 and 10.

Structural rivets, Chicago, 1.83c; boiler rivets, 0.10c extra.

Bolt and Nut Discounts

(Delivered within 20-cent freight radius.)

Carriage bolts, ⅜ x 6 inches, small and shorter, rolled threads, 80 and 2½; cut threads, 75 and 17½; larger and longer, 70, and 15.

Machine bolts with hot pressed nuts, ⅜ x 4 inches, smaller and shorter, rolled 80 and 7½; cut, 80 and 2½; larger and longer, 70, 10 and 10.

Gimlet and cone point lag or coach screws, 80 and 20.

Hot pressed square, blank or tapped nuts, $6.00 off list; hot pressed hexagon blank or tapped, $6.70.

Cold pressed C. & T. square, blank, or tapped, $3.80 off; hexagon, blank or tapped, ⅜ inch and larger, $6.80 off; ½-inch and smaller, $7.40.

Wire Products

PITTSBURGH

Wire nails, jobbers' carload lots, $1.55 to $1.60; retailers' carload lots, $1.60 to $1.65; cut nails (western makers) jobbers' lots, $1.60; painted barb wire, jobbers' carload lots, $1.55 to $1.60; retailers' carload lots, $1.60 to $1.65; plain wire to jobbers in carloads, $1.35 to $1.40; and to dealers in carloads, $1.40 to $1.45; polished staples, $1.55 to $1.60; galvanized staples, $1.95 to $2.00.

CHICAGO

Wire nails, jobbers' carload lots, $1.73; retailers' carload lots, $1.78; retailers' less than carload lots, $1.83; painted barb wire, jobbers' carload lots, $1.73; retailers' carload lots, $1.78; retailers' less than carload lots, $1.83, with 40c for galvanizing; plain wire, jobbers' carload lots, $1.53; retailers' carload lots, $1.58.

Cast Iron Pipe

CHICAGO

Four-inch water pipe, $26.50; 6 to 12 inches, $25.00; larger sizes, $23.50; gas pipe, $1 a ton higher.

NEW YORK

Six-inch pipe, 30 pounds to the foot, $22.00 to $23.00, f. o. b. New York, in carload lots.

BIRMINGHAM

Water mains, 4-inch, $22.50; 6-inch and up, $19.50. Gas main: $1 per ton higher than water main. Special fittings, $47.50 to $52.50.

Old Material

PITTSBURGH

(Gross Tons Delivered.)

Heavy melting scrap	$10.75 to 11.25
Rerolling rails	13.50 to 14.00
Malleable	10.50 to 10.75
Bundled sheet scrap	6.00 to 6.50
Iron axles	22.00 to 23.00
Old iron rails	13.00 to 13.50
Stove plate	8.50 to 9.00
No. 1 wrought scrap	11.50 to 12.00
Old car wheels	11.00 to 11.50
Low phosphorus	14.25 to 14.50
Machine shop turnings	6.25 to 6.50
No. 1 busheling	8.50 to 9.00
Cast borings	7.50 to 7.75
No. 1 cast scrap	11.00 to 11.50

PHILADELPHIA

Gross tons delivered to consumers' plants, in eastern Pennsylvania and western New Jersey:

Old iron rails (nominal)	$15.50 to 16.00
Old steel rails (rerolling)	12.00 to 12.50
No. 1 heavy melting steel	9.75 to 10.00
Old car wheels	12.00 to 12.50
Old iron axles (nominal)	20.00 to 21.00
Old steel axles	15.75 to 16.25
No. 1 railroad wrought	12.75 to 13.00
Wrought pipe	9.00 to 9.50
Cast borings	7.50 to 7.75
Machine shop turnings	7.00 to 7.50
Heavy cast (broken)	12.50 to 13.00
Malleable	9.50 to 10.00
Stove plate	9.00 to 9.50
No. 1 forge	7.50 to 8.00
Low phosphorus	14.00 to 14.50

Freight rates per ton on scrap from Philadelphia to principal eastern consuming points are: $0.60 to Ivy Rock, Pa.; $0.65 to Phoenixville, Pa.; $0.80 to Coatesville, Pa.; $0.85 to Bethlehem, Pa., Reading, Pa., and Roebling, N. J.; $1.10 to Pottsville, Pa., Lebanon, Pa., and Columbia, Pa.; $1.20 to Harrisburg, and Steelton, Pa.; $1.40 to Milton, Pa.

CLEVELAND

Gross Tons

Old iron rails	$12.50
Old steel rails (under 3 ft.)	12.00 to 12.50
Old steel rails (over 6 ft.)	11.25 to 11.75
Relaying rails	23.00 to 25.00
Old steel boiler plate	8.00 to 8.50
Malleable iron (railroad)	10.50 to 11.00
Axle turnings	6.00 to 6.50
Steel axles	16.00 to 16.50
Malleable iron (agricultural)	8.00 to 8.50
Heavy steel	9.25 to 9.75
Country mixed steel	8.00 to 8.50
Bundled sheet scrap	6.50 to 7.00

Net Tons

No. 1 R. R. wrought	$9.50 to 10.00
No. 1 busheling (new)	8.00 to 8.50
No. 1 busheling (old)	7.75 to 8.00
No. 1 machine cast	10.50 to 11.00
No. 1 dealers' wrought	8.00 to 8.50
Machine shop turnings	4.00 to 4.50
Pipes and flues	7.00 to 7.50
Wrought drillings	4.00 to 4.50
Cast borings	5.00 to 5.50
Stove plate	8.00 to 8.25
Wrought iron arch bars (nom.)	13.00
Wrought iron piling plate (nom.)	13.00

CHICAGO

(Delivered in consumers' yards.)

Gross Tons

Old car wheels	$11.25 to 11.75
Rerolling rails (5 ft. and over)	11.25 to 11.75
Old steel rails (3 ft. and und.)	10.25 to 10.75
Frogs, switches and guards	9.00 to 9.50
Heavy melting steel	9.00 to 9.50
Shoveling steel	8.00 to 8.50

Net Tons

No. 1 R. R. wrought	$ 8.50 to 9.00
No. 2 R. R. wrought	7.50 to 8.00
Arch bars and transoms	12.00 to 12.50
Knuckles, couplers and springs	9.00 to 9.50
Shafting	11.50 to 12.00
Iron car axles	17.00 to 17.50
Steel car axles	11.75 to 12.25
Locomotive tires	10.50 to 11.00
Cut forge	7.50 to 8.00
Pipe and flues	6.25 to 6.75
No. 1 cast	10.00 to 10.50
No. 1 busheling	7.00 to 7.50
No. 2 busheling	5.50 to 6.00
No. 1 boiler cut	7.00 to 7.50
Boiler punchings	9.50 to 10.00
Cast borings	3.75 to 4.25
Machine shop turnings	4.00 to 4.50
Agricultural malleable	8.50 to 9.00
Railroad malleable	9.00 to 9.50
Angle bars, splices, etc., iron	11.75 to 12.25
Angle bars, steel	7.50 to 8.00
Stove plate and light cast scrap	8.75 to 9.25

NEW YORK

Gross tons, New York dealers' prices at tidewater, usually for eastern Pennsylvania delivery:

Old car wheels (nominal)	$10.00 to 10.50
Heavy steel axles	14.00 to 14.50
Steel shafting	12.00 to 12.50
No. 1 heavy melting steel	7.75 to 8.00
No. 1 R. R. wrought	10.75 to 11.00
Wrought pipe (not galvanized)	6.00 to 6.25
Cast borings	4.75 to 5.00
Machine shop turnings (nominal)	4.50 to 4.75
Heavy cast	10.00 to 10.50

Stove plate	6.50 to 7.00
Grate bars	6.25 to 6.75

Freight rates on scrap per ton to Steelton, Pa., Columbia, Pa., Pottsville, Pa., and Harrisburg, Pa., are $1.50 from Jersey City, and $2.00 from New York; to Coatesville, Pa., Ivy Rock, Pa., Phoenixville, Pa., and Reading, Pa., $1.50 from Jersey City, and $1.80 from New York; to Bethlehem, Pa., $1.10 from Jersey City, and $1.60 from New York; to Roebling, N. J., $1.10 from Jersey City, and $1.50 from New York; to Milton, Pa., $1.60 from Jersey City, and $2.00 from New York; to Jersey City, $1.00 from New York; to Newark, N. J., $1.10 from New York.

CINCINNATI

Gross Tons

Old iron rails	$10.50 to 11.50
Old steel rerolling	9.50 to 10.00
Old iron axles	15.50 to 16.00
Heavy melting scrap	8.50 to 9.00
Relaying rails	18.50 to 19.00

Net Tons

Old No. 1 R. R. wrought	$ 8.25 to 8.75
Bundled sheet scrap	4.50 to 5.00
No. 1 yard wrought	6.50 to 7.00
No. 1 machine cast	9.50 to 10.00
No. 1 busheling	6.00 to 6.50
Stove plate	6.75 to 7.25
Machine shop turnings	4.00 to 4.50
Cast borings	4.00 to 5.00
Heavy turnings	5.00 to 5.50
Mixed cast	7.50 to 8.00
Breakage	5.00 to 6.00
Malleable	6.50 to 7.00

BIRMINGHAM

Old iron axles (light)	$15.00 to 15.50
Old steel axles (light)	15.00 to 15.50
Old iron rails	12.50 to 13.50
No. 1 R. R. wrought	12.00 to 12.50
No. 2 R. R. wrought	10.00 to 10.50
No. 1 country wrought	9.50 to 10.00
No. 2 country wrought	8.50 to 9.00
No. 1 machinery cast	10.00 to 10.50
No. 1 steel scrap	10.50 to 11.00
Standard car wheels	12.00 to 12.50
Tram car wheels	10.50 to 11.00
Light cast and stove plate	8.00 to 8.25

BUFFALO

Gross Tons

Heavy melting steel	$ 9.75 to 10.50
No. 1 R. R. and mch. cast scrap	12.00 to 12.50
No. 1 R. R. wrought scrap	12.00 to 12.50
Old steel axles	17.00 to 17.50
Old iron axles	22.50 to 23.00
Car wheels	11.75 to 12.25
Railroad malleable scrap	11.00 to 11.50
Machine turnings	5.00 to 5.50
Heavy axle turnings	8.00 to 8.75
Cast iron borings	5.50 to 6.00
Low phos. steel scrap	16.50 to 17.00
Old iron rails	15.00 to 15.50
Boiler plate sheared	11.50 to 12.00
Bundled sheet scrap	6.50 to 7.00
Stove plate (net ton)	9.75 to 10.00
Locomotive grate bars	9.50 to 10.00
No. 1 busheling scrap	9.00 to 9.50
No. 2 busheling scrap	7.00 to 7.50
Wrought pipe	8.50 to 9.00

ST. LOUIS

(Dealers' buying prices.)

Gross Tons

Old car wheels	$10.25 to 10.75
Old iron rails	11.00 to 11.50
Re-rolling rails (5 ft. and over)	10.50 to 11.00
Old steel rails (3 ft. and und.)	9.00 to 9.50
Light sec. relayers (45 pounds and und.) subject to inspec.	23.00 to 23.50
Relaying rails, subject to inspec.	23.00 to 23.50
Frogs, switches and guards	8.50 to 9.00
Shoveling steel	8.00 to 8.50

Net Tons

No. 1 railroad wrought	$7.00 to 7.50
No. 2 railroad wrought	6.50 to 7.00
Arch bars and transoms	11.00 to 11.50
Knuckles, couplers, springs	8.00 to 8.50
Shafting	12.50 to 13.00
Steel car axles	11.00 to 11.50
Iron car axles	13.50 to 14.50
Locomotive tires	9.00 to 9.50
Pipe and flues	5.00 to 5.50
Tank iron and cut boilers	5.00 to 5.50
No. 1 cut busheling	7.00 to 7.50
Cast iron borings	2.00 to 2.50
Machine shop turnings	3.00 to 3.50
Railroad malleable	6.50 to 7.00
Agricultural malleable	5.00 to 5.50
Stove plates	6.50 to 7.00
Angle splice bars (iron)	9.00 to 9.50
Angle splice bars (steel	7.00 to 7.50

Store Prices

CINCINNATI

Steel bars, 1.75c to 1.90c; iron bars, 1.70c to 1.80c; plates and shapes, 1.85c to 2c; sheets, blue annealed, No. 10, 2.05c to 2.10c; black No. 28, 2.55c; galvanized, No. 28, 3.65c; cold rolled shafting, round, square, hexagon and flat, 55 to 58 off.

CLEVELAND

Steel bars, 1.80c; plates and shapes, 1.90c; iron bars, 1.85c; sheets, No. 10 blue annealed, 2.15c; No. 28 black, 2.60c; No. 28 galvanized, 3.60c.

CHICAGO

Steel bars, 1.65c; iron bars, 1.65c; hoops, 2.15c; shapes and plates, 1.65c; No. 10 blue annealed sheets, 1.95c, black, No. 28, 2.45c; galvanized, No. 28, 3.50c.

PHILADELPHIA

Steel bars, 1.85c to 1.90c; structural shapes, 1.85c to 1.95c; plates, 1.85c to 1.95c.

NEW YORK

Steel bars, 2.00c; structural shapes, 2.05c; plates, 2.05c.

Bethlehem Buys Milliken Steel Works

New York, Dec. 24. (By wire.)—The steel works of Milliken Bros., Inc., Staten Island, long in receiver's hands, has been bought by the Bethlehem Steel Co. The equipment will be moved to South Bethlehem. The structural fabricating plant is not included in the purchase. The steel plant includes five 50-ton open-hearth furnaces, two continuous furnaces, and three trains of rolls.

More Pig Iron Activity

New York, Dec. 24. (By wire.)—A New Jersey pipe fitting foundry has closed for 400 tons of low silicon and 400 tons of high silicon pig iron for first quarter delivery. An inquiry from outside this territory is for 1,000 tons of foundry for delivery in the first quarter.

The Northwest Steel Co., Portland, Ore., advises it is engaged in erecting structural steel works, about $40,000 having been expended for a dock to berth ocean steamships. Such new equipment as is needed has been ordered. The company expects to handle all classes of bridge and structural work, plate and pipe work, bolts and rivets.

Arrangements have been completed for the annual convention of the American Supply and Machinery Manufacturers' Association at the New Greenbrier hotel, White Sulphur Springs, W. Va., June 15-17.

Trade Publications

PUMPS. — The Gardner Governor Co., Quincy, Ill., describes its line of duplex power pumps in a recent circular.

BOILERS.—The Morrison water tube boiler is described in a recent publication of the Morrison Boiler Co., Sharon, Pa.

BLOWERS.—The Boston type blower for high pressure service manufactured by the Connersville Blower Co., Connersville, Ind., is described and illustrated in a recent bulletin.

CRUSHERS.—The C. O. Bartlett & Snow Co., Cleveland, has published a catalog illustrating and describing its line of crushers, pulverizers and feeders.

MOTORS.—Its line of round type, direct current motors is described in a recent bulletin of the Sprague Electric Works of the General Electric Co., Schenectady, N. Y.

OIL TRANSFORMERS. — An instruction book for the use of its oil transformers has been issued by the Fort Wayne Electric Works of the General Electric Co., Fort Wayne, Ind.

INDUCTION MOTORS. — The Crocker-Wheeler Co., Ampere, N. J., has issued a bulletin describing the line of induction motors for general use. Construction details of the motors are described and illustrated and several installations in industrial plants are shown.

OIL ENGINES.—Fulton Iron Works, St. Louis, has issued an unusually attractive 46-page catalog describing its Tosi, Diesel type oil engines. The pages are 8½ x 11 inches, and the details of the engine are fully covered by descriptive matter illustrated and contains some interesting statistics regarding crude petroleum and its residual products.

GEARS AND ROLLING MILL PINIONS.—The Mesta Machine Co., Pittsburgh, in an eight-page bulletin illustrates and describes its line of gears and rolling mill pinions. Various types of gears are shown as well as the methods pursued in this company's plant for molding gears and for cutting the teeth on pinions and large gear wheels. Data also are included covering safe loads for molded cast steel gears and pinions.

AIR COMPRESSORS.—An eight-page bulletin, issued by the Gardner Governor Co., Quincy, Ill., is devoted to this company's line of horizontal duplex air compressors. This machine consists practically of two single cylinders of the self-oiling type, placed side by side on a common base, coupled to one crankshaft with one flywheel for both machines. The compressor is well adapted for use in industrial plants generally where compressed air is employed and is built in belt-driven and in steam-actuated types.

FURNACES.—A 16-page catalog issued by the W. S. Rockwell Co., 50 Church street, New York City, is devoted to furnaces for industrial heating operations. The mediums described include forge, annealing, case-hardening, and other heating furnaces as well as stationary, crucible and reverberatory melting types. Among the large annealing furnaces described is one with a capacity of 80 tons per charge which is used for treating sheets, wire, etc., as well as a large ingot heating furnace equipped with shaking grates. An automatic rotary hardening furnace also is shown as well as furnaces for heating plates, drawings and photographs. The catalog also angles, etc.

The Bessemer Limestone Co., Youngstown, advises the addition it has under way will add 150,000 brick per day to its capacity, giving an output of 375,000 brick per day. The plant is to be completed by July 1.

SPLENDID PROGRESS

Made in Reducing Accidents in Michigan and Minnesota.

Washington, Dec. 23.—In a review of the work accomplished in the campaign to reduce the number of deaths in the mines of the United States, the federal bureau of mines today placed the states of Michigan and Minnesota in the honorable mention column.

The report, which deals with fatalities in the metal mines of the country for 1912, shows that Michigan has reduced its total of deaths in the copper and iron mines from 134 in 1911 to 96 in 1912; that Minnesota has reduced its total deaths in the iron mines from 76 to 50 in the same period. The death rate for every 1,000 men employed in Michigan was 4.24 in 1911 and 3.26 in 1912; and in Minnesota 4.59 in 1911 and 3.02 in 1912.

The 38 less lives lost in Michigan represent one miner saved for every 1,000 employed and the 26 less lives lost in Minnesota represent one and one-half miners saved for every 1,000 at work.

"The decreases in Michigan and Minnesota in a year's time are the most remarkable we have encountered so far," said Dr. Joseph A. Holmes, the director of the bureau today, "and were largely due to an active campaign during the last three years. It is indeed gratifying to note that the Lake Superior mine operators are meeting with such marked success within so short a time. It shows what may be done in other states if special efforts are made to safeguard all engaged in the mine industry.

"I do not wish to be understood as agreeing that the death rates in Michigan and Minnesota are as low as they should be, or as low as they will eventually become, but I do say that these two states in the year have made more real progress toward the desired goal than others in the Union, either in metal or coal mining, and that much credit is due the mine owners in these states for their activities in behalf of safety."

Mr. Holmes spoke of the "friendly co-operative spirit" between the operators, the miners, the state inspectors and the bureau of mines, and then recites that the bureau's report on metal-mine accidents in the United States in 1912 shows 661 men killed, 4,502 seriously injured, and 26,232 men slightly injured out of a total number of 169,199 men employed. The figures show a decrease of 34 deaths from 1911, despite the fact that Alaska, with 21 fatalities, is included for the first time in the 1912 report. The death rate for 1912 was 3.91 for every 1,000 employed as against 4.19 in 1911.

The report on metal-mine accidents completes the mortality statistics for the mining industry for 1912 and shows in coal mining, metal mining and quarrying, a total of 3,234 deaths for the year, with a death rate of 3.22 as against 3,602 in 1911 and a rate of 3.58 in every 1,000 employed.

MEET AT NILES

Salesmen of Deforest Sheet & Tin Plate Co. Hold Conference.

The Deforest Sheet & Tin Plate Co., Niles, O., held its annual sales conference with various representatives Dec. 15 to 20 inclusive. Friday a complimentary entertainment was given at the Niles Theater which all of the employes of the company attended. This included exhibition of an industrial film showing the manufacture of steel from iron ore to tin plate. The film was furnished by the Farrell Film Co., of Farrell, Pa., and proved to be highly entertaining as well as instructive.

At this entertainment the company's plan to organize among the workmen themselves a "Safety First" department was outlined by the general superintendent of the plant, Charles W. Martin. The policy briefly outlined is to provide for a safety committee to be elected by the men and for monetary reward for any suggestions by the workmen which are accepted by the safety committee.

During the year extensive improvements which were started during 1912 have been completed, and the present capacity of the mill is more than double that provided for when the plant was built originally about four years ago. The plant as now completed has ten hot mills, six galvanizing kettles and ample facilities for producing sheet steel of all gages between Nos. 8 and 34 inclusive, and specializes on sheets of extreme widths and lengths, which are not ordinarily produced.

The following is a list of the sales representatives attending the convention: M. L. Filley, New York City; E. L. Perkins, Boston; Geo. G. Falconer Jr., Philadelphia; J. K. White, Richmond, Va.; William H. Meyst, Chicago; Paul R. Jordon, Indianapolis; H. C. Beckwith, St. Louis; Howard Flinn, Detroit; E. V. Porter, Pittsburgh, A. L. Jones, Buffalo; Geo. A. Thompson, Chicago; R. J. Hutchings, Pensacola.

COMPULSORY LAW

Passed by New York Legislature—Unusual Provisions.

The New York compulsory workmen's compensation act which recently was recommended by Governor Glynn, was passed by the legislature of that state in extraordinary session, Dec. 12. In the senate the bill prevailed by a vote of 35 to 6 and in the assembly it carried unanimously. The law provides that in the event of the accidental death of an employe, while about his regular duties, the employer first pays the funeral expenses not to exceed $100. If the employe is married his widow is paid 30 per cent of his wages until her death or remarriage. In the event of remarriage, the beneficiary receives in a lump sum what she would have received over a period of two years and compensation then ceases. In no case shall the death benefits computed upon wages exceed $100 per month. Provision is made for compensation to children of the deceased until they reach the age of 18. An alien beneficiary leaving the country will receive one-half of his commuted compensation instead of one-half of his whole compensation. When injured, a workman is to receive medical attention at the expense of his employer for 60 days and the latter may furnish the physician direct. A waiting period of two weeks before compensation begins shall elapse. Compensation for the loss of a hand, foot, eye or leg is limited to $20 a week, and all other compensation for injury is limited to $15 a week. The provisions of the bill are to be administered through a commission which shall have power to examine the books of employers and shall be in charge of a state insurance fund to be supported by employers. Several companion bills were also passed by the legislature at the same time with the compensation act, including the appropriation of $150,000 for the compensation board and for a state insurance fund, and providing for the formation of mutual casualty insurance companies by employers which are to be protected against the competition of foreign casualty companies until July 1, 1917.

Operations have been started in the new plant of the Wheeling Sheet & Tin Plate Co., Yorkville, O., five mills being put to work.

The Reading Transit & Light Co., Reading, Pa., has filed notice of authority to increase its debt from $750,000 to $50,000,000.

THE IRON TRADE REVIEW

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Would Legalize Labor Trust

A decision last week in the United States court of appeals, at New York, of a famous Danbury hatters' case comes at a time when the unions are pressing a bill, introduced in both the House and Senate of Congress, to legalize the boycott and labor trust. The recent decision, which follows others growing out of the same strike, affirms a judgment amounting with interest and costs to $272,000 in favor of a firm of hatters and against the United Hatters' Union of North America. Judge Coxe in his finding said that while no one disputes the proposition that labor unions are lawful and beneficial when fairly conducted, they must obey the law and the anti-trust act is applicable to combinations of labor.

The pending bill would make it impossible to break up a labor trust, for its measures provide that it shall not be unlawful for persons employed or seeking employment to enter into any arrangements, agreements or combinations with the view of lessening the hours of labor, or of increasing their wages, or of bettering their condition; nor shall any arrangements, agreements, or combinations be unlawful among persons engaged in horticulture or agriculture when made with the view of enhancing the price of agricultural or horticultural products. In other words, any kind of a conspiracy to boost wages and increase the cost of living would be lawful. It also provides that no federal judge or court may issue an injunction in a labor dispute or against an agricultural combination, save to prevent "irreparable injury to property or a property right of the party making the application for which there is no adequate remedy at law". Of course, the object of this vicious class legislation is to make certain that government officials will not find a way to prosecute labor trusts in spite of the provision of the last sundry civil appropriation bill forbidding the use of public funds appropriated to enforce the Sherman act to prosecute labor organizations which violate it.

Business men of the country should speak out in no uncertain terms concerning this unjust and un-American proposition. A mere reading of the text of the proposed law is enough to show that it is utterly unworthy of support.

Leader Mann, of the minority of the House of Representatives, is now the champion calamity howler of the country. Regardless of what he may think of the tariff and currency laws, it is the part of the statesman to give them a fair trial. By his present course, he will only invite more disaster for his party.

Progress of Forty Years

At the time when another year is about to pass into history, a striking picture of past conditions in the iron trade is presented in the first annual report of James M. Swank, as secretary of the American Iron and Steel Association. This report, which is dated Nov. 20, 1873, is being sent to members of the association by Mr. Swank as a souvenir of his forty years' connection with the association. "It takes us back," says Mr. Swank, "to those days of the American iron trade when production of iron and steel by the whole country was exceedingly small as compared with the magnificent results of recent years; to the time when our great steel industry was strictly in its infancy; when the steel rail had just ceased to be an experiment and steel skyscrapers were unknown; when the manufacturing processes in use were often primitive and the whole iron trade lacked the skill and enterprise and daring of the present day; when capital invested was counted by thousands of dollars where now it is counted by millions; when one-half of our pig iron production was made with anthracite coal; and when the development of our vast resources of Lake Superior iron ore and Connellsville coking coal had just commenced."

As one glances over the volume, he is indeed impressed by the wonderful progress which has been made during the past 40 years. In the year 1873, the output of pig iron for the entire 12 months was not much more than is being made per month this year. The tonnage was 2,695,434. In the production of steel, the contrast with the immense production of today is even more impressive, for in 1873, only 140,000 tons of Bessemer and 3,500 tons of open-hearth steel were made in the entire country, as compared with a total of about 30,000,000 tons of steel this year. Shipments of iron ore from the Lake Superior district amounted to only 1,000,115 tons, and even that small total was an increase of 269,403 tons

over 1872. Contrast these figures with the nearly 50,000,000-ton movement of the present year! There were, however, more blast furnaces in the country than there are today, but, of course, the capacity was very much less. The report of 1873 states that there are 636 completed stacks in the country, or about 200 more than there are today.

The year of 1873 was, of course, a period of very serious business disturbance and the report gives considerable space to describing conditions. It says that "prices were beaten down to the lowest possible cost of production, thousands of workingmen were out of employment and thousands of others were working at reduced wages; furnaces, rolling mills and foundries everywhere were idle; stocks of unsold iron were in almost every market," and Mr. Swank inquires whether under such conditions it is wise to encourage the importation of foreign iron by continuing the reduction of duties which Congress had twice authorized during the past four years. Prices of those days, however, were extremely high as compared with those of today, and the tariff was also high. Immediately before the panic of 1873, Bessemer rails were selling at $120, iron rails at $75, No. 1 pig iron at Philadelphia, $42, and merchant bars at Pittsburgh, 3½ cents.

That there was considerable agitation against the railroads 40 years ago is shown by the chapter entitled "The Farmers and the Railroads", in which mention is made of the effort of the farmers to have the national government pass a general law prescribing maximum rates of freight on all interstate railroads. Mr. Swank suggests, as a remedy for the alleged evils from which the farmers claimed to be suffering, a home market for their surplus agricultural products.

While the statistics of 40 years ago were not collected with the fullness of those of the last report of the American Iron and Steel Association and its successor, the American Iron and Steel Institute, Mr. Swank is entirely justified in saying that his first annual report "established the standard, even in its yellow cover, for all the annual reports of the association". The yellow cover, it is true, has been displaced, but all essential features of the old reports have been retained and the statistics of 40 years form an imperishable monument to the ability and industry of James M. Swank.

Co-operation Without Socialism

The announcement of Attorney General McReynolds of the agreement for the reorganization of the American Telegraph & Telephone Co. without litigation was received with much favor by the business world and accepted as a practical demonstration of the desire of the administration to assist great companies to conform to the law without going to court. Immediately there was a better feeling throughout the country, and a little more of this common sense dealing will be of incalculable value in restoring confidence.

There must be co-operation between the government and business, but the country hopes there will be no regulation which tends toward Socialism. In a recent interview, Director of Corporations Davies said:

"Along with the reasoning of men like Roosevelt goes the conviction that the government must fix the prices of products. It seems to me that once prices are regulated by the government, socialism is a logical and inevitable finality.

"I am not a Socialist, nor, in my view of them, are the American people Socialists. We are not ready now, if we ever shall be, to throttle self-interest, energy, initiative, and imagination, not alone in agriculture and industry, but in art, law, medicine and literature."

This tendency is illustrated in the city government of Cleveland at present. The operation of the street railroads by a private company, while control is vested in the city authorities, has not proved satisfactory, but is the cause of continual disagreement. Hence there is agitation for the city to take over the street railroads, and this probably will be done in due course of time. There is plenty of opportunity for regulation without attempting to fix prices.

A Case of Low Price and Prompt Delivery

Newspapers have devoted some space recently to a report emanating from shipbuilders on the Clyde, Scotland, that an order for 4,000 tons of nuts and bolts has been taken by makers in the United States in competition with those in the Midlands. Our Birmingham, England, correspondent sends us a clipping from a newspaper published in that city, which, under the caption, "American Competition; How a Big Order was Lost in the Midlands; The Moral", says that by fixing hundreds of thousands of pounds in plant and machinery, the shipbuilders on the Clyde can, by "kind permission of the riveters", do so much shipbuilding in a given time. They take tenders for nuts and bolts and find that the American prices are the lowest. Naturally, the American offer is accepted.

As to the moral, our Birmingham contemporary says:

"The moral which we draw from the transaction is that the nut and bolt makers of the United Kingdom have not a sufficient productive capacity relatively to that of the industries—shipbuilding, for example—which depend upon them for their material. Much the same is in different degrees true of other industries which provide the material of shipbuilding, as the repeated tardy deliveries of stuff go to show. They have no margin of resources for a busy time like the present. They have no margin which may be drawn upon in normal times in order to make up the leeway caused by strikes. The coal strike proved that to be the case over a very large area. That is exactly the defect of their economical organization, which nature makes good by allowing foreign manufactured material to flow in, and it is, therefore, positively silly to invite the public to witness how bread is taken out of British mouths by the dumping of foreign semi-manufactured stuff. The question is not, in this aspect, one of tariff reform versus free trade. It is one of common sense. The people who complain about it would not, we imagine, care to go far with a team composed of a big horse and a Galloway pony. Yet that is, in effect, what the smaller material-providing concerns are doing just now with the shipbuilding, the engineering, and other large British industries. The simple truth is that they have either to fall into line with modern industrial methods or fall out altogether. Shipbuilders are in pure self-defense entitled to go abroad for their material if the deliveries offered are better."

There are times, of course, when American mills also fail to make prompt delivery, but at present, and probably for a considerable time to come, all mills will be able to take care of all the business which England cares to send us.

Lawyers Forget Their Old Troubles

And Good Feeling Prevails as Steel Corporation Hearings Are Ended for This Year—More Testimony About Competition

The humdrum legal routine necessarily attendant upon the examination of innumerable witnesses was suddenly relieved last Friday at the Steel Corporation dissolution suit hearings. That day marked the last of the hearings in 1913. All trivial animosities were forgotten and the undercurrent of professional rivalry which constantly has prevailed between the opposing attorneys was succeeded by a manifestation of unrestrained glee. Judge Dickinson, chief counsel on the government side, and Richard V. Lindabury, of the defense, who have exchanged many a bitter sally, and who on one occasion were restrained by the examiner, John A. Brown, from going out into the hall to settle a disagreement, clasped each other in a rib-cracking embrace. The examiner, the attorneys and their assistants, the stenographers and the reporters all plainly showed their gratification at the prospect of a temporary relief from the tension which they have been under all fall.

Hearings in Atlanta

On Jan. 5, the hearings will be resumed in Atlanta, Ga., probably at the Piedmont hotel in that city. On Jan. 7, or thereabouts, witnesses will be examined at Birmingham, Ala., at the offices of the Tennessee Coal, Iron & Railroad Co New Orleans will be the next stop, and the hearings there will begin either on Jan. 9 or Jan. 12, probably in the local offices of the Carnegie Steel Co. From New Orleans the hearings will be shifted to St. Louis, and later to Chicago. It is expected that the trip will terminate in New York about Jan. 25, although it is possible the time will be extended to include one or two other cities.

Jos. D. Gallagher, of Glen Ridge, N. J., vice president of the American Brake Shoe & Foundry Co. since 1902, and general counsel for that concern for the past year, told about the method which he pursues in buying his company's requirements of plates and bars, which amount to about 10,000 or 12,000 tons annually.

"Never since I took charge of that end of the business did I pay the price that was first asked," said Mr. Gallagher. Generally, he said, he placed the contracts at his own figures. He always negotiated with all the companies that submitted bids, he said. "I always bothered with them all, as I never knew when any of them were at the bottom."

F. S. Landstreet, New York, vice president of the Consolidation Coal Co., said his company is the second largest holder of coking coal acreage in the country. It has 120,000 acres of coking coal in eastern Kentucky which runs on the average about 12,000 tons per acre. This coal has been opened only during the past two years and the production is now about 1,000,000 tons a year. The Consolidation company supplies the Illinois Steel Co. with coking coal, said Mr. Landstreet. Mr. Landstreet said the entire output of the Consolidation company in bituminous coal per year, is 14,000,000 tons. He said he purchases about $100,000 or more worth of steel a year, mostly bars, rails and structural shapes. He testified that there is active competition in the sale of these products.

Clarence L. Campbell, New York City, purchasing agent of the Corn Products Refining Co., said he buys about $10,000,000 worth of all kinds of materials for his company annually. In steel products, not much is purchased outside of tin plate. In 1909 the company used 269,839 base boxes; in 1910, 330,945 boxes; in 1911, 309,460 boxes; in 1912, 286,901 boxes, and for the first ten months of 1913, 213,000 boxes. On this tin plate, said Mr. Campbell, he has always paid 5c to 10c less than was quoted in the trade papers.

Mr. Campbell testified that he looks at the trade papers every Thursday morning. The first thing he looks for is the price on tin plate.

"What importance do you attach to the tin plate quotations carried in the trade papers?" asked Judge Dickinson.

"Well, I just look to see what they have got."

"Oh! you look at them for amusement?"

"Yes, that's it, for amusement."

Competes With Corporation

Albert L. Lehman, vice president and general manager of the Blaw Steel Construction Co., Pittsburgh, said his company does structural steel fabricating work and competes successfully with the American Bridge Co. in the manufacture of steel poles and transmission towers, which products they make in common. The Blaw company, said Mr. Lehman, buys structural shapes, plates and sheets. This year, it bought about 15,000 tons, 75 per cent of which was shapes, most of the balance being plates. These materials, he said, are and always have been bought by the company on a competitive basis. During the past three or four years, he said, prices as quoted by different manufacturers, have shown considerable variation.

Chas. G. Taylor, assistant purchasing agent of the Westinghouse Electric & Mfg. Co., Pittsburgh, since 1895, said the steel products which his company buys are bars, plates and sheets, principally. It buys on a competitive basis.

Frederick K. Randall, partner and general manager of the Brooklyn Metal Ceiling Co., Brooklyn, N. Y., was a witness at the Steel hearings December 18. He said that he buys about 1,400 tons of cold-rolled Bessemer sheets for his company annually. These are bought on contract and on a basis of competititive bidding. Bids from manufacturers have always varied, he said, and he never was quoted the same price on a contract by two bidders, with the exception of the last contract he let, in November, of this year, when three sheet makers quoted the same price and a fourth quoted $1 lower per ton than the others. This, he said, is the only time in his experience as a buyer that such a thing has happened. As a rule, said Mr. Randall, quotations from the different manufacturers have varied from $1 to $6 a ton.

Robert M. Repp, Pittsburgh, manager of the Logan-Gregg Hardware Co., said his company deals in numerous steel products, including nails, 20,000 to 25,000 kegs per year; barbed and plain wire, 200 to 250 tons; poultry netting, 12,000 to 15,000 bales, etc. All of these products are purchased by the Logan-Gregg company on a basis of competitive bidding, said Mr. Repp. Asked as to competition in the sale of nails, he said prices as quoted by the different manufacturers have varied since the time the Pittsburgh Steel Co. went into the business, in 1903. He said he can generally purchase nails at less than the trade papers quote.

Charles T. Marsh, Pittsburgh, general purchasing agent for the Gulf Refining Co., the Gulf Pipe Line Co., and their constituent companies, said he buys from 12,000 to 15,000 tons of pipe a year. This is purchased on a basis of competitive selling and the bids received from different manufac-

turers always vary. He testified to keen competition in the pipe industry. He also said he buys about 600,000 feet of wire rope a year and said he has always found very keen competition in the wire rope industry. He remembered the wire rope "pool", and said purchasing agents at the time were generally cognizant of the existence of the "pools". He said members of these "pools" frequently made him concessions from the regular "pool" price. He said that only in one single year has he let a wire rope contract to the American Steel & Wire Co. As a rule that company quotes too high to get his business, said Mr. Marsh.

Secures Bids

John M. Olmsted, vice president of the Buffalo Pitts Co., Buffalo, testified that his company makes steam engines, road machinery and other apparatus, and that it has been in business since 1836. He has been with the company since 1900, during part of the time as purchasing agent. He testified that his company uses about 5,000 tons of steel a year. Of this 60 per cent is bars, while the remainder embraces shapes, plates, shafting, sheets, springs, etc. These materials are generally bought on contracts, which are let after competitive bids have been received from steel companies. Mr. Olmsted was asked as to his experience in regard to competition in the trade and whether he had ever heard of any price agreements.

"Well," he said, "it is a purchasing agent's duty to watch these things. There is an undercurrent that prices are fixed."

"What do you mean by an undercurrent?" asked Attorney Lindabury in alarm.

"I mean there is an opinion."

This resulted in a long series of questions. The witness' general testimony was to the effect that prices are generally quoted by steel manufacturers at about the same level. He testified that they usually, however, vary from each other. He said he does not know of any price agreements nor does he know of anything which would indicate that the different steel people are in agreement as to prices. The witness was unable to give accurate data as to the prices which were quoted on his company's business by various steel companies.

Harrison G. Spangler, assistant manager and purchasing agent of the McKinney Mfg. Co., manufacturer of hinges and other hardware, Pittsburgh, testified that his company buys about 500 tons of wire and about 10,000 tons of bar and hoop mill products on contracts which are let at favorable times. Mr. Spangler said there is much competition in the sale of bars, hoops and bands and quotations generally vary from $1 to $3 a ton. He also testified there is active competition in the sale of wire and that varying prices are submitted.

George Heard, Pittsburgh, president of the Natural Gas Co. of West Virginia, said he had looked through the records of his company for the past eight or nine years and found that it bought on an average of something more than 2,000 tons of pipe a year. This, he said, was bought in job lots and on a competitive basis.

Mr. Heard said he does not recall any harmony in quotations submitted by various manufacturers during the entire time he has been in business and he testified positively that there has been no such harmony during the past eight or ten years. He said the size of the National Tube Co. is advantageous to the oil industry, in which business he formerly was engaged. The National Tube Co., he said, is the most energetic concern he knows of in manufacturing goods adaptable to the varying wants of the trade. He said as president of the Natural Gas Co. he relies on the National Tube Co. for equipment of a special nature.

Dillworth B. McClelland, Pittsburgh, said that on Jan. 14, 1904, he became manager of sales for Spang, Chalfant & Co., and retained this office until Jan. 15, 1906, when he became vice president and treasurer. These offices he still occupies. Spang, Chalfant & Co. make both iron and steel pipe. While the company has seven pipe furnaces, the same number it had in 1904, it has greatly increased the production by improving the furnaces and adding to their efficiency, so that in 1904 about 65,000 tons of tubing were turned out, while the production at present has grown to approximately 150,000 tons. The company has 28 puddling furnaces. It makes some of its iron skelp and buys iron skelp. It makes steel skelp and buys some, and it buys some billets to roll into skelp. These purchases, said Mr. McClelland, are made on a competitive basis and he testified that there is active competition between the makers of skelp and billets.

Davis N. Glass, Pittsburgh, purchasing agent for Booth & Flynn and the William Flynn interests, said he buys great quantities of pipe, ranging from $10,000 to $1,800,000 worth annually. This pipe is bought on a basis of competitive bidding and he said there is active competition between the manufacturers of pipe.

Fred L. Hawes, purchasing agent for Treman, King & Co., hardware dealers, Ithaca, N. Y., said his company is a buyer of wire nails, barbed and plain wire, fence wire, poultry netting, bars, sheets, etc. Altogether it buys from 2,500 to 3,000 tons a year. These products, said Mr. Hawes, are bought on a basis of competitive bidding, as a rule, although he buys all the roofing plates from the American Sheet & Tin Plate Co.

Charge Was Unreasonable

Washington, Dec. 23.—The Interstate Commerce Commission in an opinion handed down last Saturday in the case of the French Battery & Carbon Co., Madison, Wis., against the Lake Shore & Michigan Southern Railway Co., et al., held that the rate charged on five carloads of manganese ore shipped from Elyria, O., to Madison, was unreasonable to the extent that it exceeded the aggregate of the intermediate rates to and from Chicago, amounting to $3.968 per gross ton. Reparation of $160.52 was awarded to the complainant. Charges were collected at the joint rate of $4.90 per gross ton, totaling $759.62. The shipments were made in 1911. On Oct. 21, 1912, the joint rate from Elyria to Madison was reduced to equal the aggregate of the intermediate rates, or $3.968, and the defendants announced they were willing to make reparation on this basis.

Mr. Scott Returns.—John R. Scott, manager of sales of the Carnegie Steel Co. in the Cleveland district, has returned from a trip to Europe, accompanied by his wife and daughter. Mr. Scott is greatly improved in health, but does not expect to take up his business duties for some time.

The Reliance Automatic Lighting Co., Racine, Wis., advises its incorporation is the outcome of the purchase by Benjamin F. Flegel of the interests of H. D. Gunlefinger in the partnership heretofore existing between them. Mr. Flegel holds 98 per cent of the stock.

The new steel mill of the International Iron & Steel Construction Co., Evansville, Ind., has been completed, replacing the mill burned some time ago. It is 70 x 230 feet, with an ell 40 x 50 feet, semi-steel construction with steel roof.

FOREIGN MARKETS

LUXEMBURG IRON TRADE

Esch, Dec. 11.

The Chambers of Luxemburg have approved the proposals submitted by the Gelsenkirschen, the Luxemburgische-Differdange, the Steinfort (Felten-Guillaume et Cie.) and the Ougree-Marihaye Works for the division between them of about 580 hectares of iron ore lands which remain to be granted in the Esch-Rumelange and Differdange districts. The minimum yearly rent is 2,100 francs ($420) per hectare. In consequence of this decision the Felton-Guillaume Works will take in hand the construction of new steel works and rolling plant, and for this purpose land extending over about 60 hectares in the neighborhood of Esch has been acquired. The extension now in progress or contemplated at the works of the Burbach-Esche-Dudelange Co. include the construction of a new wire-rolling mill at Esch to replace one at Burbach. The construction of a rotating open-hearth furnace at Dommeldange is being actively pushed.

FRENCH IRON TRADE

Paris, Dec. 11.

Business is quieter than usual at this time in France, says word from Longwy. The price for No. 3 foundry iron is fixed at 84 francs ($15.96), which makes a decline of 6 francs ($1.14). The export of Belgium fell away very much recently owing to the reaction in that country. The monthly production in France is about 400,000 tons at present against 435,000 and 440,000 in preceding years. There is a declining demand for rails and general rolled goods, some rolling works having their order books thinner by 20 to 30 per cent than at the same time last year. Parisian Girder Syndicate quotes 240 to 250 francs ($45.60 to $47.50) for the spring time against 220 francs ($41.80) at present, and business is being easily done at the prices named. There are considerable stocks in hand. The price for girders in the Longwy district is 190 to 195 francs ($36.10 to $37.05), and on the Loire, where prices are usually 10 francs ($1.90) higher, the same figure is now quoted, namely, 195 francs. Business has gone off for bar iron in the north where competition is keen with Belgium. The truth respecting the French iron market is as before; that it is so largely independent of foreign orders and so confident in home business that the uneasiness of the moment is looked on with relative indifference, the tone for the coming months being very good.

BELGIAN IRON TRADE

Brussels, Dec. 11.

Recently the iron trade in this country looked like improving, but things are now again coming to a standstill. Not only are furnacemen dissatisfied with the reduction in the price of coke by 2 francs (38 cents) per ton, which is to come into force with the beginning of the year, as insufficient in view of the depressed condition of trade in pig iron, but German competition has become keener still, and prices have reached a point at which the production of iron becomes ruinous. This leads to the further damping down of furnaces. The Cockerill works, which in the autumn had seven furnaces in blast, have now only four in active operation. This, however, is largely offset by the starting of new furnaces, the building of which has just been finished. Foundry iron is now at 71 francs to 72 francs ($13.49 to $13.68), puddling at 57 francs ($10.83), Thomas iron at 64 francs to 65 francs ($12.16 to $12.35) per ton, and even these prices are not extreme figures.

During the past month the output of pig iron has further increased; it amounted to 212,390 tons against 204,780 tons in the same month last year. The reduction of semi-finished steels is claimed to be inadequate under present conditions; they now stand at 106½ francs ($20.23½) for sheet bars and 104 francs ($19.76) for billets to home consumers, and only that on condition that the buyers engage to cover their entire requirements in Belgium. For export, bars are quoted £4 10s ($21.90); girders, £4 14s ($22.88); rods, £4 18s to £4 19s ($23.85 to $24.09); plates, £5 ($24.34), and sheets £5 3s to £5 15s ($25.07 to $27.99), according to thickness, all f. o. b. Antwerp. During the past fortnight the railway department has placed some large orders for locomotives and other rolling stock, which has relieved a number of mills from anxiety for a considerable time.

GERMAN IRON TRADE

Berlin, Dec. 11.

Although things are not going forward so smartly as seemed to be promised a fortnight ago, conditions in the German iron trade are fair. Some of the heads of large works state they are doing better for export, but admit prices are distinctly unprofitable. From Breslau, it is reported that orders are coming in more freely, particularly for bars. On the other hand, the shipbuilders report that the orders booked have been lighter than in the previous month. Siegvalley Ore Syndicate has opened its books for the first half-year of 1914 at prices a half mark (11¾ cents) lower per ton. Prices for rolled wire and also for English wire netting are left unchanged, and the prospects for the latter are stated to be anything but promising. The branch of the trade which is in the best position is no doubt the railway rolling stock engineering. These works have enormous orders on hand from the state railways, and they are being added to further, the Bavarian lines just now negotiating for heavy supplies for next year.

The iron trade of Germany has become so finely organized that in order to obtain an adequate margin of profit it is necessary to keep costs of production at the minimum, and that is only possible when the works are running up to or near their maximum capacity. The output of the Steel Syndicate is being maintained at a high level, but despite the huge production of manufactures and semi-manufactures there is a surplus of raw iron for which it is necessary to find an outlet abroad. The great German syndicates, which nowadays include every stage of manufacture from the mining of the coal and ironstone to the distribution of the most highly finished articles, seem to find it necessary to maintain their production at top-notch capacity irrespective of their own actual requirements.

The output of pig iron in Germany and Luxemburg for November aggregated 1,587,288 tons, as against 1,651,447 tons in October of this year and 1,537,205 tons in November, 1912. Since Jan. 1, 17,682,140 tons have been produced, as against 16,285,546 tons for the first 11 months of 1912. The shipments returned by the Asso-

ciation of German Steel Producers for November totalled 462,000 tons crude steel weight as against 524,891 tons for October, and a decrease of about 30,000 tons as compared with November, 1912.

At the meeting on Dec. 4 of the members of the Association of German Steel Producers it was resolved to maintain unaltered prices and conditions for the sale of semi-finished material for the first quarter of 1914. Railway material is improving owing to the larger demands of Prussian state railways.

SWEDISH IRON TRADE

Stockholm, Dec. 11.

According to the reports of the regular meeting of the Swedish Iron Works Union the situation in Sweden has not been materially affected by the general uneasiness that has prevailed on the international iron market. The works there are well occupied, and are provided with orders to keep them going for some time in the coming year. Respecting export crude iron, the production for the first half of next year has already been sold at good prices; besides, considerable quantities of export crude iron are being dealt in for delivery in 1915 and 1916. The works that produce a high quality of rolled iron and steel are busy as they were before, and good sales have been made for delivery next year at fairly satisfactory prices—such as have been obtained in the current year. The works are likewise well supplied with orders for inland consumption, many of them having sold well into next year on the same account. According to statistics touching the third quarter of the year, there were 113 blast furnaces alight against 103 in the third quarter of 1912. In the ten months, January to October, 418,300 tons of iron and steel goods were exported of which 176,000 crude, 30,000 billets and rails, 106,500 bar iron, etc.

Will Blow In.—The Cumberland furnace, at Cumberland, Tenn., which is operated by the Warner Iron Co., of Chattanooga, Tenn., will be blown in shortly after the first of the year. The Globe furnace at Jackson, O., will also be blown in early in 1914. The Belfont stack at Ironton, O., was blown in early in December.

The damaged plant of the Muncie Ornamental Iron Works, Muncie, Ind., burned a few days ago, will be rebuilt at once. John Fitzgibbons and Chauncey Hanika are owners.

ORE RECEIPTS

At Lake Erie Ports Make Record in 1913.

Figures compiled by *The Marine Review* from the returns sent in by the various dock companies show that iron ore receipts at Lake Erie ports during the season of 1913 were 39,099,647 tons, out of a total movement of ore by lake of 49,070,478 tons. Lake Erie docks on December 1 held a balance of 9,261,676 tons, the smallest amount in five years.

During 1912 the total shipment by lake was 47,435,777 tons, of which Lake Erie docks received 37,472,108 tons, and held a balance on Dec. 1, 1912, of 10,080,798 tons. During 1911 the total shipment by lake was 32,130,411, of which Lake Erie docks received 25,531,550 tons and held a balance on Dec. 1, 1911, of 9,469,869 tons. During 1910 the total shipment by lake was 42,620,201 tons, of which Lake Erie docks received 34,042,897 tons and held a balance on Dec. 1, 1910, of 9,797,980 tons. During 1909 the total shipment by lake was 41,683,873 tons, of which Lake Erie docks received 33,672,825 tons and held a balance on Dec. 1, 1909, of 9,471,428 tons. The reserve of 9,261,676 tons is more than will be needed for winter consumption. Never in the history of the trade have 5,000,000 tons gone forward from dock to furnace during the winter season.

Shipments to furnaces between May 1 and Dec. 1, 1913, aggregate 35,747,800 tons, compared with 33,421,251 tons in 1912, compared with 23,011,274 tons in 1911, 29,724,938 tons in 1910, 30,030,559 tons in 1909, 17,254,782 tons in 1908.

The shipments to furnaces during the season of navigation, as referred to, are determined in this way: First, we have the amount of ore on Lake Erie docks as of May 1 last, 5,909,829 tons; add to this the receipts of the season just closed, 39,099,647 tons, and the total is 45,009,476 tons; deduct the amount on dock Dec. 1, 9,261,676 tons, and we have 35,747,800 tons as the amount that was forwarded either direct or from dock to furnace yards.

It is understood, of course, that the difference between the total output of 49,070,478 tons which was shipped from the Lake Superior mines during 1913 and the receipts of 39,099,647 tons at Lake Erie ports, is ore that went to places other than Lake Erie ports, such as furnaces at Lake Michigan ports. The amount of ore on dock May 1, 1913, as given above, does not include April receipts, which amounted to 262,047 tons. The accompanying table shows receipts at Lake Erie ports and amounts on dock during the six years past.

IRON ORE RECEIPTS AT LAKE ERIE PORTS, GROSS TONS.

	1913.	1912.	1911.	1910.	1909.	1908.
Toledo	1,084,215	1,411,278	493,345	1,225,202	1,374,224	680,553
Sandusky	.....	.....	.....	.....	11,088	.....
Huron	687,485	540,586	223,947	197,951	243,082	213,377
Lorain	3,709,213	3,771,350	2,937,605	2,884,738	2,796,856	2,286,388
Cleveland	8,812,583	7,914,836	4,584,211	6,344,943	6,051,342	4,240,815
Fairport	2,037,126	1,810,381	666,365	1,516,434	1,734,277	1,518,961
Ashtabula	8,336,126	8,158,080	6,359,131	9,620,638	8,056,941	3,012,064
Conneaut	7,849,303	7,839,831	6,931,278	6,309,548	7,007,834	4,798,631
Erie	713,904	547,067	289,400	942,592	1,235,057	828,602
Buffalo	5,506,691	5,060,642	2,802,976	4,704,439	5,002,235	2,835,099
Detroit	363,001	418,057	243,292	296,412	159,889	.....
Total	39,099,647	37,472,108	25,531,550	34,042,897	33,672,825	20,414,491

IRON ORE ON LAKE ERIE DOCKS, DEC. 1, GROSS TONS.

	1913.	1912.	1911.	1910.	1909.	1908.
Toledo	349,047	549,473	661,382	433,215	332,456	590,925
Sandusky	2,472	2,472	2,471	17,728	39,557	36,079
Huron	441,541	385,810	344,371	375,118	477,333	458,158
Lorain	694,704	904,343	652,526	630,547	912,768	1,508,744
Cleveland	1,930,720	1,888,560	1,589,491	1,638,795	1,547,142	1,458,392
Fairport	478,014	565,920	636,566	839,970	867,640	835,821
Ashtabula	3,202,807	3,350,553	3,295,862	3,287,816	2,594,359	2,295,531
Conneaut	1,248,032	1,429,533	1,237,573	1,329,997	1,411,002	1,296,675
Erie	594,613	661,330	636,274	792,011	788,046	730,530
Buffalo	319,726	340,261	413,353	452,783	501,125	315,148
Total	9,261,676	10,080,798	9,469,869	9,797,980	9,471,428	9,074,003

Paid Dividend.—The Chicago Foundry Convention committee which had charge of the entertainment of the visiting foundrymen in October has wound up its affairs. After the payment of all expenses, sufficient surplus remained in the fund which had been collected to return a dividend of 11 per cent to the contributors. A small residue remained after the payment of the dividend, which was donated to the United Charities of Chicago.

Officers have been elected by the newly organized Peerless Floor Surfacing Machine Co., Oshkosh, Wis., as follows: President and treasurer, Fred C. Horn; vice president, R. T. Schuttler; secretary, George J. Horn.

NEW BUSINESS

In New York, due to the desire of buyers to close for their requirements before the end of the year, the machinery market is experiencing a spurt of activity. None of the purchases, however, has been of unusual size, generally involving no more than two or three tools. Among the purchasers is the Chevrolet Motor Co., which bought several tools, including a drill press, a milling machine, a second-hand lathe and a screw machine. The New York Central has placed some orders and has issued some small inquiries. The Pennsylvania railroad is also sending out some small inquiries, but has not closed for anything important recently. Demand from railroads is almost totally lacking, and no improvement in this connection is expected until the Interstate Commerce Commission takes action on the application of eastern roads for higher freight rates, or until some intimation is received as to what this action will be. The belief is current in the trade that no decision will be handed down till next September. The volume of export business is considerably improved, and new orders are coming in from France, England, Italy, Belgium and Austria. There is little demand from Germany. The domestic second-hand machinery demand is fairly good.

In Cincinnati, no improvement is expected in the machinery market before the first of the year. The majority of machine tool makers are not very busy at the present time, and a number of machinists and salesmen are being laid off each week. Some of the machine shops are barely operating, and it would probably be safe to say that not more than three machine tool makers here are running 60 per cent or over of their full capacities. It is also estimated that about 65 per cent of the machinists employed in machine shops in this city are out of employment. The foundries are also experiencing a very dull spell and are decreasing their working forces each week. There a number of good sized lists for machine tools before the market that have been put out by various railroads, which may be closed for soon after the first of next year.

ALABAMA

THOMAS.—The Republic Iron & Steel Co., Birmingham, will reconstruct iron furnace No. 1 at a cost of $75,000 practically building a new plant.

ARIZONA

FLAGSTAFF.—The Atchison, Topeka & Santa Fe railroad plans to construct a water system here. The work includes a 50,000,000-gallon reservoir and an 8-inch pipe line. Estimated cost, $162,000.

ARKANSAS

HEBER SPRINGS.—Cleburne county commissioners are receiving bids for the erection of a court house to be erected here at an estimated cost of $75,000.

STUTTGART.—The Arkansas Machine & Boiler Works has been incorporated. W. H. Duckett, Thomas F. Ryan and Harvey Toms are among the incorporators.

WALNUT RIDGE.—The city has engaged Frank L. Wilcox, St. Louis, as engineer for the water-works and sewer system. Estimated cost, $70,000.

CALIFORNIA

FRESNO.—The Fresno Consumers' Ice Co. plans to erect an addition to its plant here at an estimated cost of $20,000. R. F. Felchlin, architect.

GRIDLEY.—The Albert Taylor Co. plans to erect a 55 x 160-foot two-story reinforced concrete building, contract for the construction of which was recently awarded to O. A. Peter, Oroville.

REEDLEY.—Plans are being prepared by Chris P. Jensen, Fresno, for extensions to the water-works system, estimated to cost about $35,000, including street mains and a 60,000-gallon steel tank.

SACRAMENTO.—Bids will be received until Jan. 6 for a 150-horsepower water-tube boiler for the Sonoma state home at Eldridge, Cal. W. F. McClure, state engineer.

SACRAMENTO.—The Golden West Motors Co. advises it has bought for its new plant only such machinery as is procurable on the coast. It will require regular machine tools with individual motor drive. Foundry equipment will not be installed at present.

SAN DIEGO.—The San Diego Consolidated Brewery plans to make improvements and additions in its bottling plant. New machinery equipment will be installed. About $25,000 will be expended.

SAN FRANCISCO.—The Metal Shelter Co. has been incorporated; sheet metal devices; $25,000; by G. A. Fox, W. M. Dean and K. D. Dean, San Francisco.

SANTA CRUZ.—The citizens recently voted to issue $165,000 in bonds for the construction of a 2,750-foot pier. L. C. Williams, city engineer.

VISALIA.—The Frank Avery Construction Co. will erect a plant here at an estimated cost of $100,000.

CONNECTICUT

GREENWICH.—The Citizens' Gas Co. recently secured a site here, upon which it will erect a plant to cost approximately $75,000.

SHELTON.—The New York, New Haven & Hartford railorad plans to erect a one-story brick freight house here. Plans call for a 35 x 100-foot structure.

STRATFORD.—The Bridgeport Engineering Co., formerly the Norwalk Engineering Co., plans to erect a 60 x 150-foot factory of mill construction.

DISTRICT OF COLUMBIA

WASHINGTON.—Sealed proposals will be received at the office of the general purchasing officer, Isthmian canal commission, until Dec. 30, for furnishing hardware for administration building at Balboa.

WASHINGTON.—Bids will be received until Jan. 27 by O. Wenderoth, supervising architect, treasury department, for the construction of the United States post office at Clarksdale, Miss.

WASHINGTON.—The Heurich Brewing Co. plans to erect a one-story concrete ice plant here at an estimated cost of about $20,000. Machinery equipment will cost about $30,000. Upton-Smoot Construction Co., contractor.

FLORIDA

JACKSONVILLE.—The committee of public works has authorized the immediate construction of the proposed Duval street bridge. The structure will be 1,400 feet long and will cost about $150,000. The St. Johns Terminal Co. and the Seaboard Air line will bear the expense.

MIAMI.—The Marbleized Cement & Monumental Co. will open bids Feb. 1 for the erection of a 100 x 300-foot fireproof building. Machinery bids will be opened at that time.

GEORGIA

BAINBRIDGE.—The Miller Mfg. Co. has been incorporated; machinery; $1,500; by M. E. Nussbaum, M. H. Nussbaum and C. A. Miller.

IDAHO

HOMEDALE. — The Homedale Water, Light & Power Co. has been incorporated for $150,000 to supply this city. C. M. Hill and D. M. Sullivan and others are incorporators.

TWIN FALLS.—The state highway commission is preparing to construct a bridge to have four 100-foot spans over the Snake river above Shoshone Falls. Edward S. Smith, Boise, state highway engineer.

ILLINOIS

CHICAGO.—A. H. Anderson, 1215 Fulton street, is having plans prepared for a brass foundry. Plans call for a two-story, 25 x 120-foot structure estimated to cost $6,000.

IOWA

DES MOINES.—Bonds amounting to $100,000 will be issued by Polk county for the construction of 63 bridges during 1914.

KANSAS

ATCHISON. — The McKinley Syndicate plans a large power plant here at an estimated cost of $250,000. H. E. Chubbock, Peoria, Ill., general manager.

KENTUCKY

LOUISVILLE.—Bids will be received until Jan. 15 by Major C. Oakes, Corps of Engineers, U. S. A., for a steel pump boat.

LOUISIANA

NEW ORLEANS.—Bids will be received by Favrot & Livaudais, architects, for a court house and jail for Allen parish estimated to cost $100,000.

MARYLAND

BALTIMORE.—The Diez & Roemer Brass Co. recently purchased a site 20 x 72 feet here upon which it plans to erect a four-story fireproof factory for the manufacture of bronze, brass and aluminum castings.

MASSACHUSETTS

BOSTON.—Bids will be received until Jan. 2 by the Lighthouse Inspector for furnisning one steel mast, ironwork, etc., for the lighthouse tender Mayflower.

BRIGHTON.—The Rivet Lathe & Grinding Co. is having plans prepared for a brick and concrete, three-story, 60 x 100-foot addition. Frost & Chamberlain, Slater building, Worcester, architects.

SPRINGFIELD.—The Agawam Electric Co. has petitioned the state board of gas and electric light commissioners for permission to increase its capital $100,000 for enlarging its plant.

WORCESTER.—Bids are being received for the erection of a market at Main and Madison streets, estimated to cost $100,000. O. C. S. Ziroli, architect.

MICHIGAN

MT. CLEMENS.—The Flyer Automobile Co., Detroit, plans to begin construction work soon on its new plant here. A. A. Gloetzner, general manager.

SAULT STE. MARIE. — The Northern Foundry Co. has had plans prepared for the construction of a machine shop in connection with its foundry. Estimated cost $13,000.

MINNESOTA

DULUTH.—The Minnesota Radiator Co. has begun operations. The foundry is 50 x 140 feet, and several smaller buildings house the office and small departments.

MISSISSIPPI

GULFPORT.—The Southern Arts and Crafts Society, recently incorporated here by Harry T. Howard, of Biloxi, plans to erect an arts and crafts school at an estimated cost of about $250,000.

HATTIESBURG.—The Hattiesburg Wood Reduction Co., whose plant was recently damaged by fire, will rebuild. The company has increased its capital from $50,000 to $100,000.

PASCAGOULA.—Bids will be received until Jan. 5 by the board of supervisors of Jackson county for the erection of 26 steel bridges in this county.

MISSOURI

KING CITY.—The King City Electric & Mfg Co. plans to install a 30-kilowatt three-phase 60-cycle 2,300-volt generator, three-kilowatt exciter and tungsten lamps. Machinery will be purchased. Harry V. Forest secretary.

PARIS.—The town plans to purchase two tubular boilers and a direct-connected genating unit. George C. Blakeley, superintendent of lighting plant.

ST. LOUIS.—The Milbradt Mfg. Co., manufacturer of pipe, secured a permit to erect a one-story, 95 x 128-foot factory here at an estimated cost of $10,000.

ST. LOUIS.—Frederick W. Drosten recently purchased a three-story building which will be remodeled for an automobile salesroom. A new building 30 x 30 feet, three stories, will be erected at an estimated cost of $40,000. Albert B. Groves, St. Louis, architect.

MONTANA

GLASGOW.—The city clerk has been authorized to advertise for bids for new unit for lighting plant to cost about $5,000.

GREAT FALLS.—The contract for constructing the new theater building for the Rocky Mountain Insurance Co. here has been awarded to A. W. Miller at $78,690.

MALTA.—The council has passed ordinance calling for sewer and water-works systems.

ROUNDUP.—A bond issue of $60,000 was recently voted for purchasing the water system and plant of the Roundup Water Co.

NEBRASKA

GENEVA.—Bids will be received until Jan. 13 for bent and pile, steel and wooden bridges required during the year beginning Jan. 13, 1914. Bert A. Lynn, Fillmore county clerk.

NEW JERSEY

BAYONNE.—The city council has authorized a bond issue of $200,000 for the erection of a school in the northern section of the city and one of $107,000 for an addition to school No. 2.

RIDGEWOOD.—The Palisade Machine Co. has been incorporated; $6,000; by H. G. Travers and Philip Haven, Ridgewood and Albert C. Perry, Jersey City.

NEW YORK

ALBANY.—The Hudson Navigation Co. plans to construct 800 feet of concrete docks. Charles W. Morse, president.

ALBANY.—The Fibre & Steel Container Co. has been incorporated; $500,000; by M. J. McMullen, T. Tracy, George Costigan, 2 Columbus Circle, Albany.

ALBANY.—Plans are being prepared for a structural steel, brick and stone theater to be erected here by F. F. Proctor at an estimated cost of $150,000. Arland W. Johnson, New York City, architect.

ALEXANDRIA BAY. — The Thousand Island Park Association is having plans prepared for rebuilding the two-story brick and stone Columbia hotel. Estimated cost $300,000. R. E. Grant, president.

AUBURN.—The Auburn Theological Seminary plans two buildings, one to be used as a gymnasium. Estimated cost $500,000. Dr. Stewart, Morgan hall, president.

BROOKLYN.—The Robert Gair Co. has filed plans for a 12-story brick factory estimated to cost about $275,000. William Higginson, New York City, architect.

BROOKLYN.—The Bay Ridge Iron Works has been incorporated; $20,000; by Louis Hernsheim, Brooklyn; Franz Sigel, Sidney L. Duck and R. L. Flamm, New York City.

BUFFALO.—Bids will soon be asked by the commissioner of public works for the erection of a 720-foot steel viaduct in Chicago street. Francis G. Ward, commissioner of public works.

BUFFALO.—The Otis Elevator Co. is erecting a 120 x 423-foot foundry of brick and steel construction estimated to cost about $200,000. The building will be equipped with new machinery. A special feature will be an electric furnace with a daily capacity of 12 tons.

CHARLOTTE.—The commissioners of Monroe county are having plans prepared for a bridge over the Genessee river here. Estimated cost $175,000. John Y. McClintock, Rochester, county superintendent of highways.

GAINESVILLE.—The state highway department has ruled that the town must erect or rebuild six bridges on the new state highway between here and Warsaw. A meeting will be held to formulate plans for securing the necessary funds.

NEW YORK CITY.—The Modern Washerless Faucet Mfg. Co. has been incorporated; $50,000; by Adolph Paul, George Peterson and W. E. Willis, 101 West 128th street, New York City.

NEW YORK CITY.—The American Motor & Transmission Co. has been incorporated; $50,000; by C. H. Bassford, E. V. Nixon and E. Reynolds, 316 West Seventy-ninth street, New York City.

NEW YORK MILLS.—The Olympian Knitting Co. is erecting a four-story 50 x 154-foot addition and a 35 x 47-foot engine house.

QUEENS.—The Oscar Trench Co., Brooklyn, plans to erect a two-story brick and steel factory here at an estimated cost of $75,000.

ROCHESTER.—Plans have been prepared for a six-story reinforced concrete warehouse estimated to cost about $700,000 for the Rochester Warehouse Co.

SCHENECTADY. — The General Electric Co. has issued a small list which specifies two or three machine tools and a tumbling barrel.

SCHENECTADY.—Bids are being received by W. L. Stoddard, New York City, for a three-story, 50 x 200-foot factory with a one-story, 50 x 130-foot wing for the Mica Insulator Co., 68 Church street, New York City.

SENECA FALLS.—The Rumsey Co., Ltd., manufacturer of pumps, recently purchased a site here, upon which it plans to erect a factory.

NORTH CAROLINA

GREENSBORO.—The North Carolina Public Service Co. is erecting a 75 x 150-foot building for which machine shop equipment will be required.

GREENSBORO. — The Revolution Cotton Mills will erect a brick and concrete addition and will install about 40,000 spindles and 1,000 looms. Estimated cost $1,000,000. C. R. Makepeace & Co., Providence, R. I., architects.

GREENVILLE.—The water and light commission will purchase one 500-kilowatt steam turbine or engine with exciter and condenser, two 250-horsepower water-tube boilers and one three-stage pump directly connected to a three-phase 2,300-volt motor. H. L. Allen, superintendent.

OHIO

AKRON.—The plant of the Enterprise Mfg. Co., manufacturer of metal specialties, was recently damaged by fire. Estimated loss about $40,000.

CINCINNATI.—The council has passed a $400,000 bond issue for laying an auxiliary 30-inch water main from the main pumping station on Eastern avenue.

CINCINNATI.—The Tool Steel Gear & Pinion Co., Carthage, is having plans prepared for a large addition to its shop, for which additional machinery will be needed.

CINCINNATI.—The machinery of the O. E. Weidlich Pen Co. was sold at receiver's sale on Dec. 18, by order of the court of insolvency of Hamilton county, O.

CINCINNATI. — The Philip Carey Co., Lockland, will soon be in the market for an electric generator and power plant equipment. The company is enlarging its power plant.

CINCINNATI.—A. C. Kubal, architect, will have charge of the installation of new boilers and a heating plant in the old building of the Crane & Breed Co., on Sycamore street, this city, which will be used as temporary offices by the Hamilton county officials during the

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The Iron Trade Review Cleveland, Ohio

The

Rolling Mill Industry

By F. H. KINDL, Engineer

A Condensed, General Description of Iron and Steel Rolling Mills and Their Products.

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In this work the author has endeavored to give a condensed, general description of iron and steel rolling mills and their products, without discussing the details of rolling any special material. Essentially, it is a summary of American rolling mill practice, its development being traced from the beginning to the present day.

An effort has been made to define more closely the various mills and their products and the various classifications herein presented have been approved by leading manufacturers and many of the country's foremost iron and steel engineers.

The charts which graphically show the production of semi-finished and finished products, from 2,000 pounds of iron ore, 1,000 pounds of coke and 600 pounds of limestone represent modern practice at some of the largest open-hearth plants and rolling mills. Charts also are included to clearly illustrate the amounts of material charged and produced in making one ton of pig iron; the distribution and production of iron and steel in 1907 and 1911; the conversion of pig iron into the various finished products, etc.

For those interested in the economics of the iron industry, a table has been prepared in which a comparison has been made of the general fundamental factors dictating the production of pig iron in the United States, Germany and Great Britain, with particular reference to the Pittsburgh district of the United States, the Rheinland-Westfalia district of Germany, and the Cleveland district of Great Britain.

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construction of the new Hamilton county court house on the site of the present one on Main street.

CINCINNATI. — The Western Methodist Book Concern will require considerable electric and power equipment for its seven-story building that is to be erected on Plum street, this city.

CINCINNATI. — Architects S. Godley & Son have been retained by Val Duttenhofer to make plans for an eight-story power building at Sixth and Sycamore streets, this city. The building will be 90 x 140 feet and of steel and concrete construction.

CINCINNATI.—Power plant equipment will be needed by the Good Samaritan Hospital, for its new power plant which is being built at Clifton avenue and Dixmyth road, this city. G. W. Drach, architect, of Cincinnati, is in charge of the building and the installation of the equipment.

CINCINNATI.—Considerable wood working machinery will be needed by the J. F. Dietz Co. when it occupies the old plant of the Schacht Motor Car Co., Winton Place, this city on Feb. 1, 1914. The capacity of the Dietz company will be almost doubled. A new boiler and power house will be built and new equipment installed.

CLEVELAND.—The Atlas Foundry Co. has been incorporated; iron and steel foundry; $10,000; by B. R. Pearse, A. Wathey, D. E. Werts and C. W. Johnson.

CLEVELAND.—Bids will soon be received for the erection of a six-story, 46 x 135-foot factory for F. Guenther & Sons. Estimated cost $125,000. Walker & Weeks, architects.

CLEVELAND.—The Cleveland Welding & Mfg. Co. has been incorporated; $4,500; by Walter W. Ellinger, John R. Barthal and Ruben Stoltenberg.

CLEVELAND. — The F. Zimmerman Co. plans to erect a two-story brick, 122 x 322-foot plant here at an estimated cost of about $70,000. A. M. Allen & Co., engineers.

CLEVELAND.—Bids will be received about Mar. 1 for the erection of an eight-story building for the Ninth Street Terminal Warehouse Co., estimated to cost about $150,000. Knox & Elliott, Cleveland, architects.

PENNSYLVANIA

ALTOONA.—The Brotherhood of Railway Trainmen's Home Association plans to erect a brick and reinforced concrete building here estimated to cost about $70,000.

COATESVILLE.—Bids will be received until Jan. 15 for a reinforced concrete dam and reservoir, a slow sand filter plant and 13,900 feet 18-inch conduit. Alexander Potter, New York City, consulting engineer.

COPLAY.—The machine shop of the Coplay Cement Mfg. Co. was recently damaged by fire. Estimated loss $40,000.

DOWNINGTOWN.—Bids will be received soon for two two-story reinforced concrete factories for the Rowe Motor Mfg. Co. Each building will be 65 x 145 feet. Richard A. Kerns Jr., Coatesville, architect.

ERIE.—The Erie Saw Works plans to erect a new building here at an estimated cost of about $4,500.

McKEES ROCKS.—The Pennsylvania state water supply commission, Harrisburg, has granted the commissioners of Allegheny county permission to erect a bridge across Chartiers creek here to require 800 tons of steel. Work will begin in the spring.

MONACA.—The Gibson Motor Car Co. has purchased the plant of the Pittsburgh Tube & Steel Co., and is remodeling it for the manufacture of automobiles. The main building is 150 x 200 feet. Equipment includes a gas-driven power plant of five horsepower. Machine tools and other equipment will be required.

PHILADELPHIA.—The Electric Service Supply Co., manufacturer of automobile accessories, will erect an addition to its factory here at an estimated cost of about $50,000.

PHILADELPHIA.—The war department will erect a fire prevention pump house and a metal storehouse at the Franklin arsenal here at an estimated cost of $32,000.

PHILADELPHIA.—Harrison Bros. & Co. plan to erect a four-story brick and concrete building. Plans call for a 45 x 65-foot structure to be used as a wedge furnace building. Ballinger & Perrot, architects.

PITTSBURGH.—The Excelsior Vending Machine Co. has been incorporated to manufacture and deal in vending machines with a capital of $100,000.

PITTSBURGH.—The Pittsburgh Railway Appliance Co. has been incorporated; $25,000; by Frank Moore, Frank T. Reese, A. E. Read, Guy L. McIntyre and A. M. Imbrie, Pittsburgh.

POTTSVILLE.—The Eastern Pennsylvania Co. has completed plans for a power house at Palo, Alta., a suburb of Pottsville. Estimated cost $350,000.

RHODE ISLAND

PAWTUCKET.—The New York, New Haven & Hartford railroad has had plans prepared for a $100,000 station to be erected between here and Central Falls. J. D. Gallary, Providence, division superintendent.

PROVIDENCE.—Plans are being prepared for the improvement of the city hall, for which a nappropriation of $150,000 has been made. Jackson, Robertson & Hall, architects.

PROVIDENCE.—The James Hauley Brewery is having plans prepared for a three-story, 50 x 160-foot addition. Wells & Dana, Boston, architects.

TEXAS

BEAUMONT.—The New Orleans Motor Co. will erect a plant here for the manufacture of motors. Estimated cost $8,000.

FORT WORTH.—The Fort Worth club is having plans prepared for a 10-story, 50 x 100-foot building estimated to cost about $200,000. Muller, Pollard & Leake, Fort Worth, architects.

GALVESTON.—The citizens recently voted $300,000 for the construction of a city hall and $200,000 for public schools.

VIRGINIA

AMHERST.—Bids will be received until Dec. 29 for a 70-foot steel bridge, with one concrete abutment and one concrete pier, over the Pedlar river. Plans with P. St. John Wilson, state highway commissioner, Richmond.

WASHINGTON

CENTRALIA.—The contract for building municipal water system has been awarded to W. H. Mitchell, Holland hotel, Seattle, for $124,758.

RENTON.—With a capitalization of $200,000, the Washington-Oregon Glass Co. has been incorporated to take over the plant of the Renton Glass works. About $30,000 will be spent on new machinery and enlarging plant. J. T. Conway, Puttsburg, president, and W. C. McConnell, 213 Marion street, Seattle, secretary.

SEATTLE.—President A. M. Ferguson, of the National Automatic Fender Co., says factory will be built in Seattle.

SEATTLE.—Daniel Murray will put up a $20,000 building at Twelfth and Madison streets for manufacture of cycle-cars. Contract has been let to David Dow.

SEATTLE.—Bonds amounting to $950,000 for new court house and $650,000 for new schools have been voted and work will start at once.

VANCOUVER.—The Nichols Mfg. Co., recently incorporated with a capital of $100,000, plans to erect a plant here for the manufacture of stoves.

WEST VIRGINIA

HUNTINGTON.—The West Virginia Paving & Pressed Brick Co. will expend about $50,000 in making improvements and additions to its brick-making plant.

PARKERSBURG.—The United States Roofing Tile Co., recently incorporated with a capital of $400,000, plans to erect a fireproof building estimated to cost $30,000.

WILLIAMSON.—The Norfolk & Western railroad plans to erect shops here for building and repairing steel cars. J. E. Crawford, chief engineer, Roanoke, Va.

WISCONSIN

ASHLAND.—The county board of supervisors has decided to conduct a competition to secure acceptable plans for the proposed new county courthouse, to cost from $110,000 to $130,000 and offers $750 in prizes. Competition closes Jan. 25. Carl Rudquist is chairman of the county board.

ASHLAND.—Unofficial advices have been received here that the Minneapolis, St. Paul & Sault Ste. Marie Railway Co. will expend about $2,500,000 in the Ashland district for one new ore dock of steel and concrete; a new roundhouse; a cut-off from Ashland to Saxon, and general improvement of the Ashland yards and division headquarters.

CHIPPEWA FALLS.—The board of public works closes bids Jan. 5 for a steel plate girder highway bridge, 140 feet long, two spans, over Duncan Creek at Jefferson avenue, and for the work of moving the present bridge to River street. L. J. Felix is city clerk.

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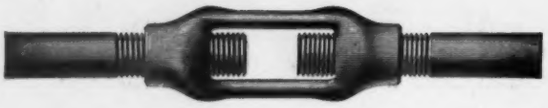

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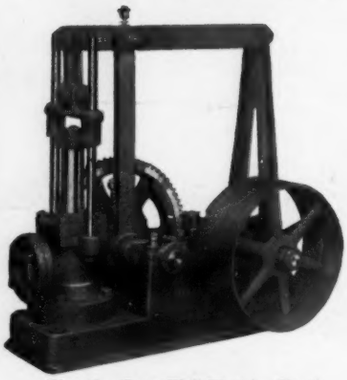

Fig. 62. Deep Well Working Head
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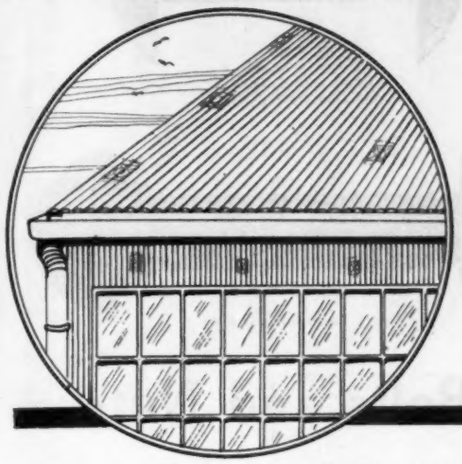

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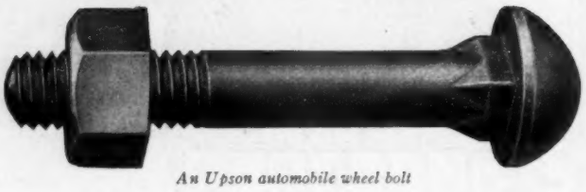

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Head of automobile oiler spring bolt, showing how it is tapped for grease-cup

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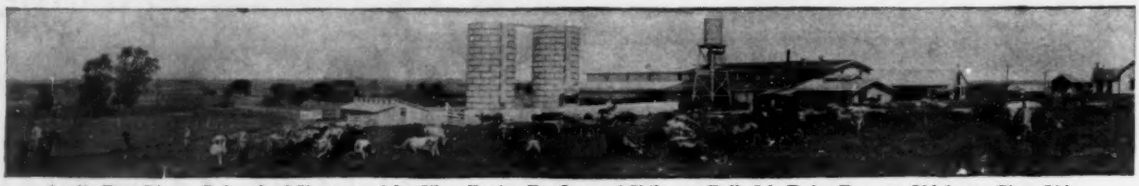

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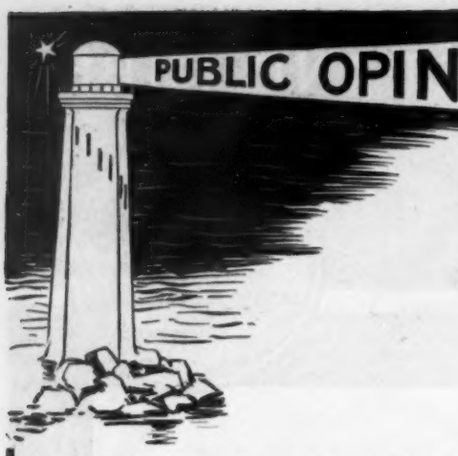

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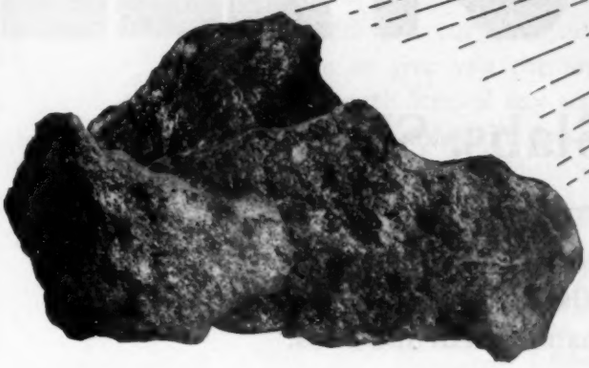

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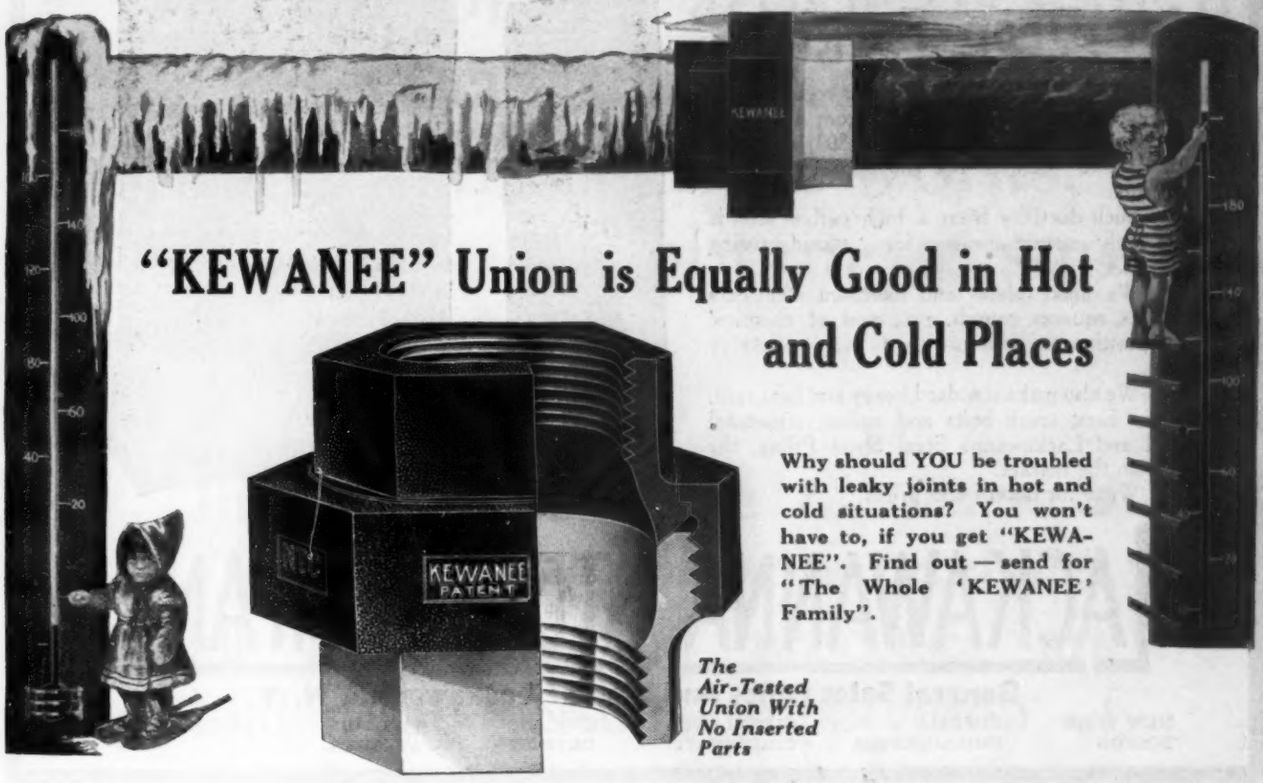
Interesting Experiences with "KEWANEE" Unions



"KEWANEE" Union is Equally Good in Hot and Cold Places

Why should YOU be troubled with leaky joints in hot and cold situations? You won't have to, if you get "KEWANEE". Find out — send for "The Whole 'KEWANEE' Family".

The Air-Tested Union With No Inserted Parts

¶ You have heard us tell about "KEWANEE" endurance under high pressures, "KEWANEE" non-corrosion, and "KEWANEE" easy disconnection. Do you think "KEWANEE" will be affected by extremes of heat or cold? ¶ Just read the following letter from the Chief Engineer of a plant in New Hampshire:

¶ "Gentlemen:

¶ "I have had an experience with 'KEWANEE' Unions that I think will be worth telling. Two years ago the management thought it would be advisable to change one of our hoisting engine units. The steam had been supplied from a boiler of its own; now it was decided to pipe it direct from the main boilers in the main power plant. We were obliged to put in a heating coil to keep the pipes from freezing. I will make a rough sketch opposite to show more plainly the conditions under which I placed the union.

¶ "This is just a rough sketch, but hope it will be sufficiently clear for purpose.

¶ "Notice the pipe to heating coil would be hot, and pipe from coil would change in length according to the temperature of condensation returning.

¶ "I used in the first place a metal union with a babbitted seat which soon leaked badly. Next I ordered some unions of different sizes, not specifying the make and got a gasket union, after putting that in, I couldn't keep a gasket in it any length of time due to the rocking motion jarring it out; kept on that way for about a year replacing gaskets which would do very well when heating coil was not in use, but leaking as soon as cold weather necessitated the use of the coil. Finally noticing how tight the 'KEWANEE' Union was cracked up to be in various trade papers, I induced the management to buy one; after putting it on the line I have had no further trouble, it has been perfectly tight since, which has been nearly a year. It worked so well, I tried one on another joint nearly as bad, and that has given no trouble since. I always specify 'KEWANEE' Unions now in my orders for pipe fittings.

¶ "Hoping this will be of some interest, I remain,"—

The 5 "KEWANEE" Reasons

(1) Brass to iron thread connection—No corrosion.
(2) Brass to iron ball joint seat—No gasket.
(3) 125 pounds compressed air test under water—No defective fittings.
(4) Solid, three piece construction—No inserted parts.
(5) Easily disconnected—No force required.

National Tube Company,
1802 Frick Bldg., Pittsburgh, Pa.

Please send me your booklet "The Whole 'KEWANEE' Family".

Name .....
Street .....
.....
City .....
State .....
With what concern .....
.....

I. T. R., 12-25-13

National Tube Company (Gen'l Sales Offices: FRICK BUILDING) Pittsburgh, Pa.

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Boston	Denver	New Orleans	Philadelphia	Salt Lake City	St. Paul

PACIFIC COAST REPRESENTATIVES:—U. S. Steel Products Co., San Francisco, Los Angeles, Portland, Seattle.
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Open Hearth Steel for Drop Forgings

The specimen shown is of our regular drop forging open hearth steel and from a 1¾ in. by 7-16 in. bar. Although the 180° bend was made *cold* there is not the slightest sign of fracture.

Such ductility from a high carbon steel is decidedly advantageous for manufacturing purposes.

We make plates and merchant steel bars in flats, squares, rounds, etc., and of chemical composition to conform to a wide variety of uses.

We also make standard, heavy and light rails, splice bars, track bolts and spikes, structural steel and Lackawanna Steel Sheet Piling, the best on the market.

Write for details and prices.

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General Sales Office and Works: Lackawanna, N. Y.

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BASIC OPEN HEARTH STEEL
FORGING BILLETS

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Boiler Tubes—Plates and Blue Annealed Sheets
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and

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Rust Resisting Products

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St. Louis, Mo. Security Bldg.
Chicago, Ill. 1515 Mc Cormick Bldg.

PERSONAL supervision of the making of any article by a m m-ber of the manufacturing firm, who has been trained in the works, is the assured way to obtain a superior product.

In the manufacture of *Jones & Laughlin Steel Company* products, all materials and processes are under the personal supervision of members of the firm who know the business thoroughly.

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Jones & Laughlin Steel Company

American Iron & Steel Works

Pittsburgh

118

Where Quality is Considered--Price should be forgotten

SQUEEZER

is an old saying, but it holds as true today as does the *old-fashioned puddling process* of making iron.

The first cost of good iron may be higher than steel, but its final cost is lower; for in the kind of work where quality should be considered, where security is necessary and service is wanted, as in Engine Bolts, Staybolts, Foundation Bolts and similar service, the economy of good Iron is indisputable.

Where work is constantly exposed to the weather, to great stress, shock and vibration, the superiority of old fashioned puddled IRON is unquestionable and true economy demands its use---

Not only have the tests of time proved *old fashioned puddled IRON* rust-resisting to a degree unheard of in steel but service tests and special tests like the vibratory test in use by nearly all large railroads, have shown the utter unfitness of steel as compared to it.

Above is the second phase in the process of converting pig iron into VULCAN FINISHED BAR.

REFINED
VULCAN
VULCAN SPECIAL
VULCAN XX

LOCKHART IRON & STEEL CO.
PITTSBURGH, PA.
VULCAN

For Ordinary Uses
For Special Purposes
For Engine Bolts
For Locomotive Bolts

Richard G. Wood, President
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Established 1826

W. W. Lukens, Sec. and Asst. Treas.
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Alan Wood Iron & Steel Co.

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IRON AND STEEL SHEETS AND PLATES
FORGING BILLETS

"A. W. Diamond" and "A. W. Ribbed" Pattern Rolled Steel Floor Plates.

Morris Building, PHILADELPHIA, PA.

FORGING AND WELDING STEEL

An **Open Hearth Steel** for forging and welding, carbon .15% to .20%, sulphur and phosphorus under .04%. You will be satisfied if you give us a trial order.

WRITE US NOW

Warehouse Department, Illinois Steel Co.
BOX I. I., CHICAGO

J. H. Hillman & Sons Company

OLIVER BUILDING PITTSBURGH, PA.

Standard Low Sulphur CONNELLSVILLE COKE

FOR

Blast Furnaces and Foundries

Shipments 3,000,000 Tons Annually. Daily Shipments 10,000 Tons.
Any Railroad Delivery

F. E. RICHARDSON, Pres. and Treas. ESTABLISHED 1865 R. D. LORD, Secretary

Pittsburgh Forge and Iron Co.

PITTSBURGH, PA.

MANUFACTURERS OF

Screw Spikes

Screw Spikes

CAR

HEAT TREATED AND ATLAS TOUGHENED

LOCOMOTIVE AXLES

CRANK PINS PISTON RODS

Screw Spikes for Soft Wood Ties

ATLAS ENGINE AND STAYBOLT IRON

HEAVY FORGINGS

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SPECIAL SOFT FORGING IRON

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TIE PLATES FOR SCREW SPIKE AND DRIVE SPIKE CONSTRUCTION

TRACK BOLTS

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Small Shapes

We now have in our new warehouse a large stock from which we are filling orders immediately upon receipt

Stock Sheets mailed regularly to those interested.

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Manufacturers, Metallurgists, Mine Owners, Merchants
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MANGANESE ORE of every grade.
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PLUMBAGO, BLACKLEAD, METAL WORKERS' CRAYONS.

We make any and EVERY ALLOY AND METAL REQUIRED
We make a SPECIAL HIGH SPEED ALLOY FOR TOOL STEEL

Carnegie Steel Company

General Offices

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CROSS TIES

Steel ties are making steady progress in displacing wood ties. There are several reasons for this.

1st—The life of one steel tie is about equivalent to that of three wood ties.

2nd—Owing to the longer life of steel ties there is a saving in labor cost equal to the difference in cost of removing and installing one steel tie and three wood ties.

3rd—At the end of their serviceability steel ties have a scrap value of approximately one-third of their original cost.

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UNITED STATES STEEL PRODUCTS COMPANY—
PACIFIC COAST DEPARTMENTS

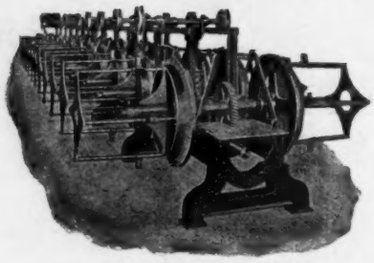
Los Angeles	San Francisco	Portland	Seattle

EXPORT REPRESENTATIVES:
UNITED STATES STEEL PRODUCTS COMPANY, New York, N. Y.

36-T

THE TURNER-VAUGHN AND TAYLOR CO.
ENGINEERS AND MANUFACTURERS — CUYAHOGA FALLS OHIO, U.S.A.

WIRE MILL EQUIPMENT



30 WIRE—SPIRAL DRIVE
GALVANIZING TAKE-UP FRAME

PATENTED DOUBLE DECK WIRE REEL.—Four fingers, which can be easily tripped, hold the top bundle in position while the bottom reel is run off. Very handy where two reels are required in small space.

Architectural and Ornamental
-IRON WORK-

The highest grade of work guaranteed.
Let us figure on your specifications.
We will give you an exceptionally strong and artistic job, and at the same time save you money.

We also manufacture:
Structural Steel; Jail and Prison Work; Iron Fences and Entrances; and Gray Iron Castings.

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Steel Bars—Angles

Plain and Twisted
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TURNED and POLISHED SHAFTING
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IN ROUNDS, HEXAGONS, SQUARES and FLATS

SPECIAL SHAPES, COLD ROLLED STRIP STEEL, DRILL ROD *and* SEAMLESS STEEL TUBING

LARGEST and MOST COMPLETE WAREHOUSE STOCK of COLD FINISHED STEEL CARRIED IN ANY CITY.

Monthly Stock List Issued

UNEXCELLED FACILITIES ENABLE US TO OFFER SHIPMENT THE DAY ORDER IS RECEIVED.

Pittsburg Shafting Co. of Detroit
DETROIT, MICH.

SPECIFY
Standard Gauge Cold Drawn Steel
FOR
Shafting
Screw Steel
Etc.

Standard Gauge is the best Steel obtainable for the purpose, properly cold drawn by experts—the originators of the sectional die for cold drawing shapes.

Its extraordinary accuracy and uniformity in size is the principal reason for its preference for particular machinery construction.

Standard Gauge Steel Co.
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Dilworth, Lockwood & Co.	NEW YORK
R. B. Ridgley	DETROIT, MICH.
Dayton Iron & Steel Co.	DAYTON, OHIO

The Greatest Galvanizing Discovery of the Age

THE American Steel & Wire Company is the first to develop a THOROUGHLY GALVANIZED WIRE. It has a thicker coat, a quality more refined, and a deeply adhesive contact of the zinc and the steel that solidly unites the two metals, highly flexible without injury, and having a finish and weather resistance unequalled—*a thoroughly galvanized wire.*

This is put into

Banner Poultry Fence brings big and quick profits to dealers, and great satisfaction to customers.

Banner Poultry Fence is a true woven wire fence and not a netting. *Larger wires without increased cost.* It is made of 15 and 17 gage wires instead of 19 or 20 gage wires as used in old style fabrics, and has 22 wires in 4-ft. height, 16 wires in 2-ft. height, making a poultry fence of *minimum close space and immense strength.*

Banner Poultry Fence Wire is hard, stiff and springy. It carries a coat of zinc put on by the latest method—a discovery, a real improvement in galvanizing— a zinc covering more lasting; *it stays on.*

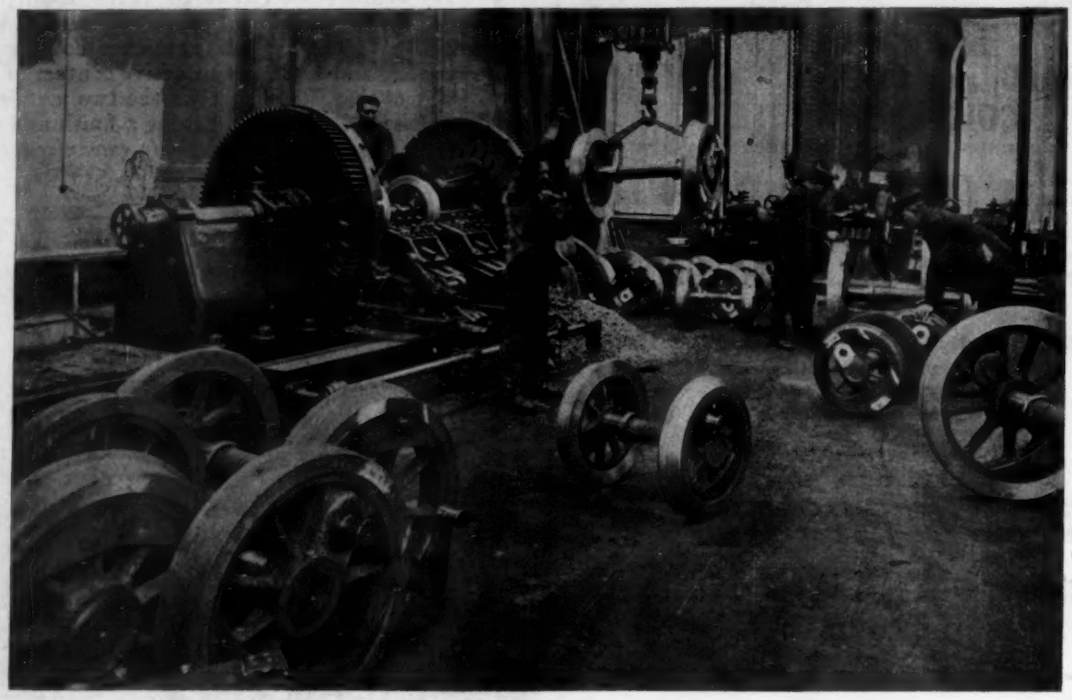
Banner Poultry Fence costs about the same as poultry netting in the principal selling sizes, despite the use of heavier wires. The close spaced wires are at the bottom where needed, with gradually increased space at the top where close spacing is not necessary. Graduated spacing means a saving which is put into larger wires *without increased cost to dealer or consumer.*

Banner Poultry Fence saves in cost of erection, because it requires fewer posts; while top and bottom rails are not needed to keep the fence in shape.

Banner Fence makes a neat construction, and forever does away with the ragged saggy appearance of old style fabrics.

FRANK BAACKES, Vice Pres. and Gen. Sales Agent}
American Steel & Wire Company
Chicago, New York, Worcester, Cleveland, Pittsburgh, Denver. Export Representative: U. S. Steel Products Co., New York. Pacific Coast Representative: U. S. Steel Products Co., San Francisco, Los Angeles, Portland, Seattle.

Flooring Efficiency!



A Permanent Floor

As each year goes by you will find that you have considerably increased the total of your flooring expenses.

Ordinary wooden floors need repairs; concrete floors need repairs.

How then can you avoid this unceasing trouble?

Install at once

Our "Heavy Duty" Creosoted Wood Blocks

You will find that they'll make you forget the need of floor repairing.

You will find that they'll introduce a great many other desirable features.

These blocks are **Smooth, Dry, Permanent, Cool, Healthful,** and **absolutely Dustless.**

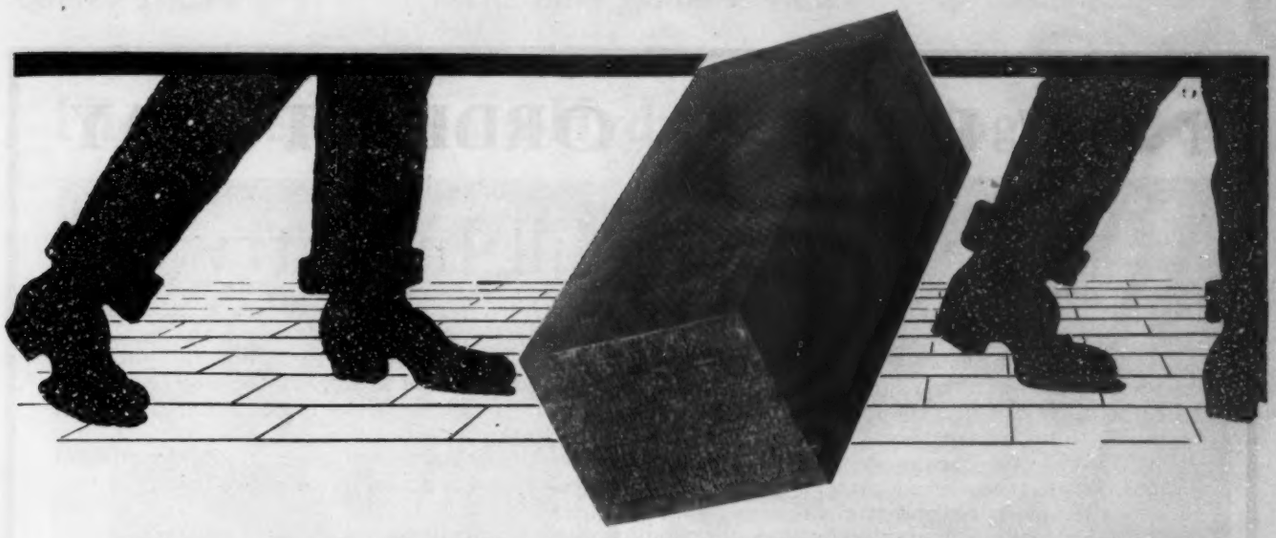
They will be a delight to both you and your employes.

Let us send you complete details telling the many reasons why YOU should install our **Heavy Duty Wood Blocks.**

Write us today.

Ohio Wood Preserving Co.
Pittsburgh Wood Preserving Co.

Commonwealth Building **Pittsburgh, Pa.**



Generations of Footsteps!

¶ Generations of footsteps will unceasingly tread on your Ayer & Lord Interior Blocks, yet your flooring will be firmer than ever. ¶ Generations of heavy industrial trucks and carts will continuously roll over your Ayer & Lord Interior Blocks, yet, instead of deteriorating, your flooring will become more serviceable. ¶ An Ayer & Lord Creosoted Wood Block Flooring when laid under the critical eyes of our superintendents will outlast your building itself—will still be in first class condition when you are in no more need of it. ¶ Repairing troubles and expenses will be unknown. Your men will not be inconvenienced in any way. ¶ Send for our little booklet "FLOORS", which will tell you the many advantages of Ayer & Lord Interior Wood Blocks.

The illustration here shows an installation of Ayer & Lord Interior Blocks in the plant of the Thew Automatic Shovel Works, Lorain, O.

We have installed many similar floors all of which have met with great satisfaction.

Let us tell you about them.

AYER & LORD INTERIOR — Always Easy on the Feet — WOOD BLOCKS

AYER & LORD TIE CO.

Railway Exchange
CHICAGO

Branch Office
801 Swetland Building
Cleveland, Ohio

NOW READY — ORDER TODAY

The Rolling Mill Industry

By F. H. KINDL, Engineer

In this work the author has endeavored to give a condensed, general description of iron and steel rolling mills and their products, without discussing the details of rolling any special material. Essentially, it is a summary of American rolling mill practice, its development being traced from the beginning to the present day.

An effort has been made to define more closely the various mills and their products and the various classifications herein presented have been approved by leading manufacturers and many of the country's foremost iron and steel engineers.

The charts which graphically show the production of semi-finished and finished products, from 2,000 pounds of iron ore, 1,000 pounds of coke and 600 pounds of limestone represent modern practice at some of the largest open-hearth plants and rolling mills. Charts also are included to clearly illustrate the amounts of material charged and produced in making one ton of pig iron; the distribution and production of iron and steel in 1907 and 1911; the conversion of pig iron into the various finished products, etc.

For those interested in the economics of the iron industry, a table has been prepared in which a comparison has been made of the general fundamental factors dictating the production of pig iron in the United States, Germany and Great Britain, with particular reference to the Pittsburgh district of the United States, the Rheinland-Westfalia district of Germany, and the Cleveland district of Great Britain.

The following list of contents and tables give an excellent idea of the book and what it covers.

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***The Rolling Mill Industry** is bound in cloth at $2 a copy, postpaid, and in full flexible leather $3. Published by*

THE IRON TRADE REVIEW

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High-Speed Steam-Hydraulic Forging Presses

Overhung Type—100 to 300 Tons Capacity

Four Column Type—300 to 12,000 Tons Capacity

Manufactured by

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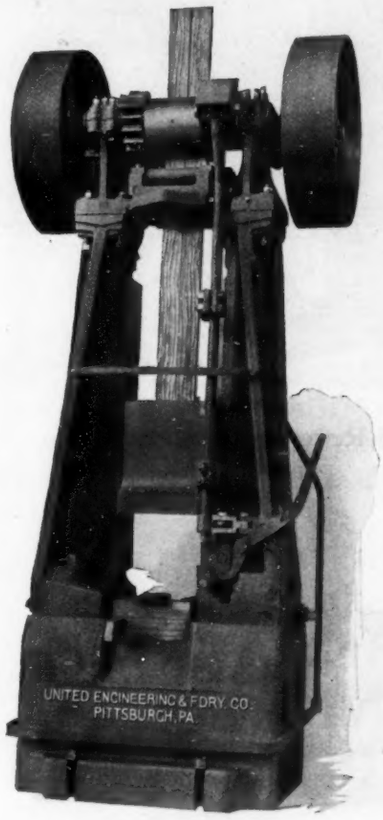
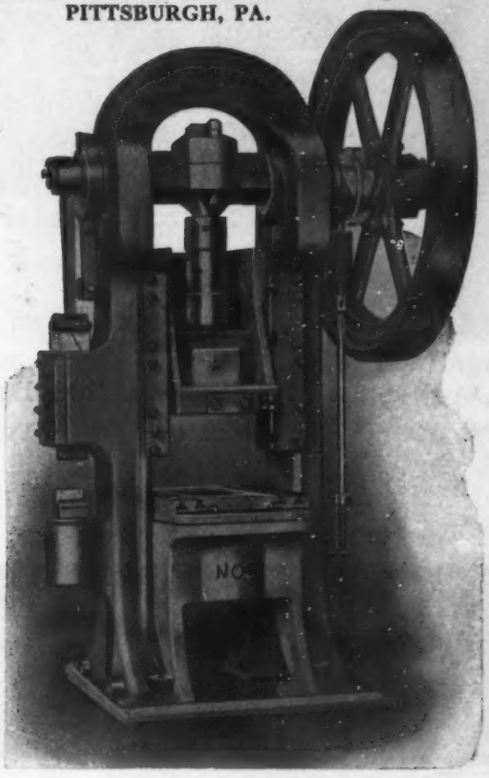
PITTSBURGH, PA.



BOARD DROPS
From 1000 to 5000 lbs. falling weight



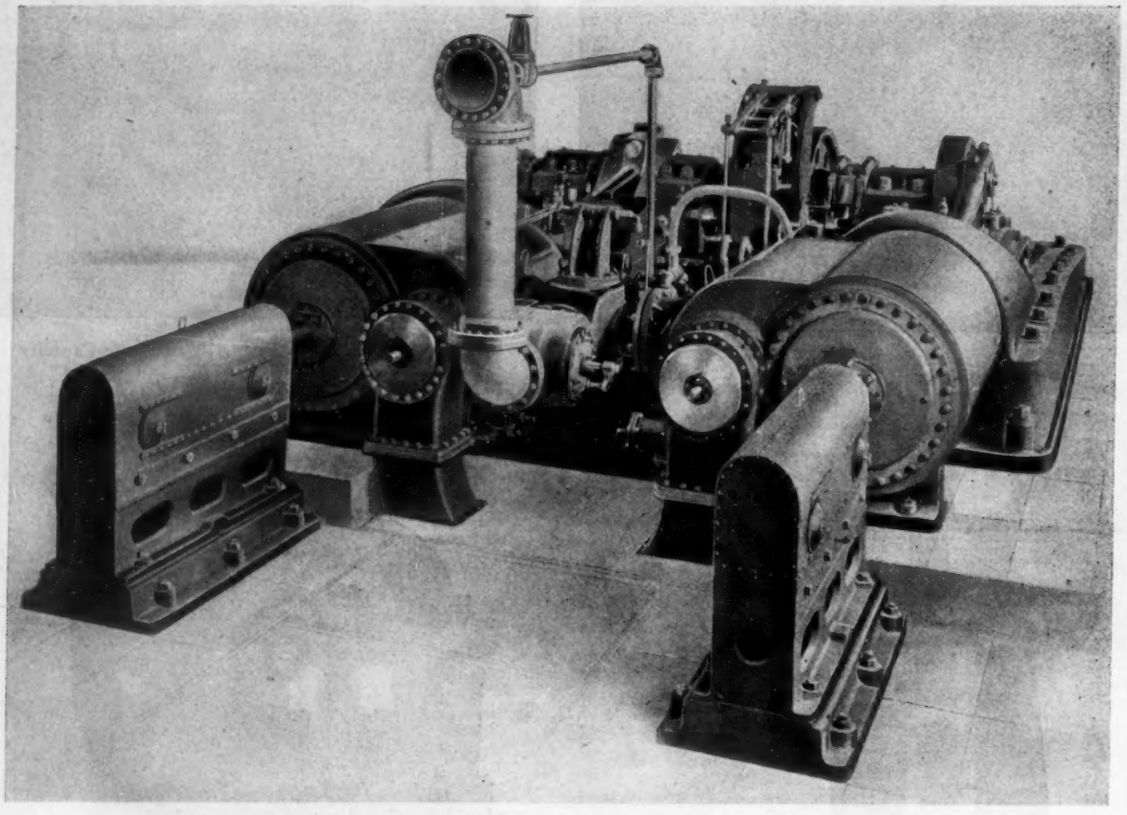
TRIMMING PRESSES
In all sizes that do the work without trouble

ENGINES

of every description

for

Rolling Mill Purposes



48 x 60 inch Twin-Cylinder Direct-Connected Reversing Engine

MACKINTOSH, HEMPHILL & CO.
FORT PITT FOUNDRY
PITTSBURGH, PA.

MESTA IMPROVED SELF-CONTAINED
PICKLING MACHINES

(PATENTED AND PATENTS PENDING)

INSTALLATION OF TWO MESTA "PATENTED" PICKLING MACHINES

THESE MACHINES ARE BUILT FOR PICKLING METAL SHEETS, STEEL STRIPS, WIRE COILS, STAMPED MATERIALS AND MANY OTHER PRODUCTS. SKILLED OPERATORS ARE NOT REQUIRED AND THE MATERIAL IS PICKLED WITH ABOUT ONE HALF THE LABOR COST AND ACID CONSUMPTION REQUIRED BY ANY OTHER PROCESS.
THE IMPROVED MACHINE OFFERS EXCEPTIONAL OPPORTUNITY FOR STEAM ECONOMY.

SEND FOR BULLETIN "M"

MESTA MACHINE COMPANY

PITTSBURGH, PA.

WORKS: MESTA STATION, P. R. R., WEST HOMESTEAD, PA.

DESIGNERS AND BUILDERS
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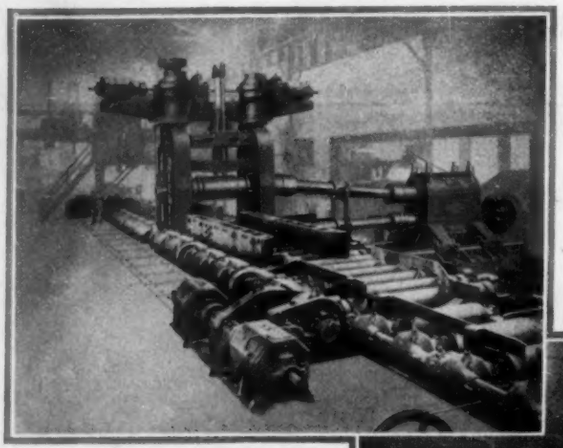
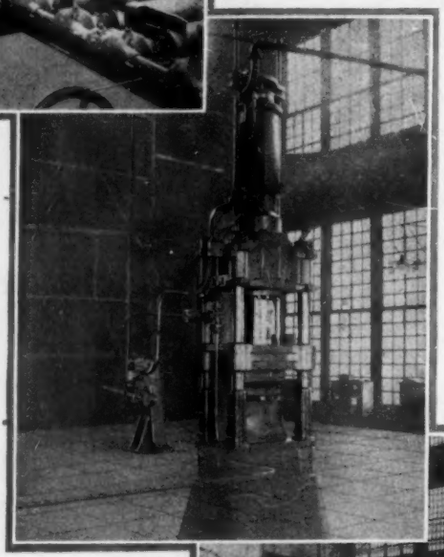
GAS AND STEAM ENGINES, AIR COMPRESSORS, ROLLING MILL MACHINERY
CUT AND MACHINE MOLDED IRON AND STEEL GEARS

MILL BUILDERS



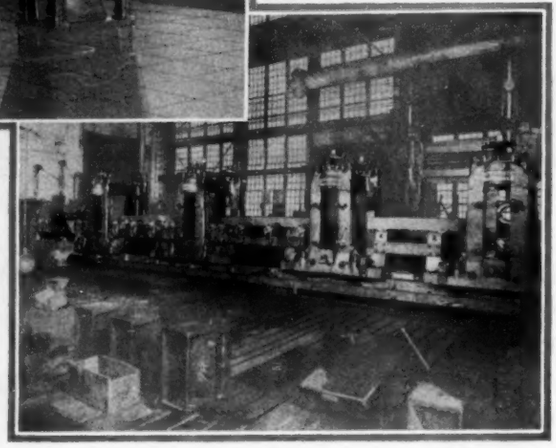
44" Blooming Mill

Built for the Youngstown Sheet & Tube Company



500 Ton Pure Hydraulic Forging Press

Built for the Canada Forge Co., Ltd. Welland, Can.



Continuous Rod Mill

Built for the American Steel & Wire Company Birmingham, Ala.

Plate Mills
Blooming Mills
Continuous Mills
Seamless Tube Mills
Hydraulic Forging Presses
Hydraulic Pumps
Mill Tables
Mill Drives
Conveyors
Shears
Rail Presses

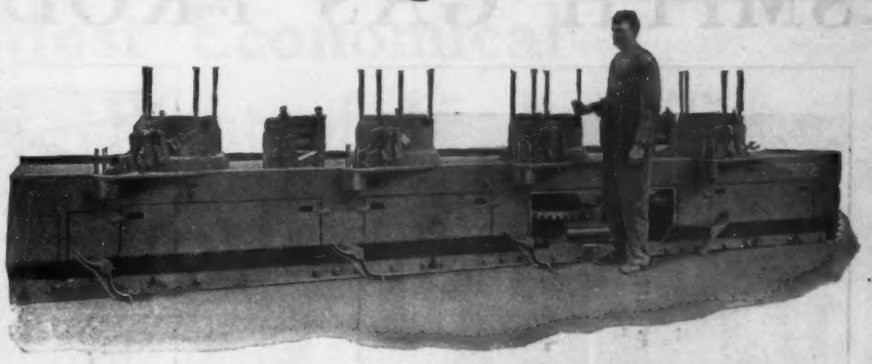
The William Tod Company

YOUNGSTOWN, OHIO

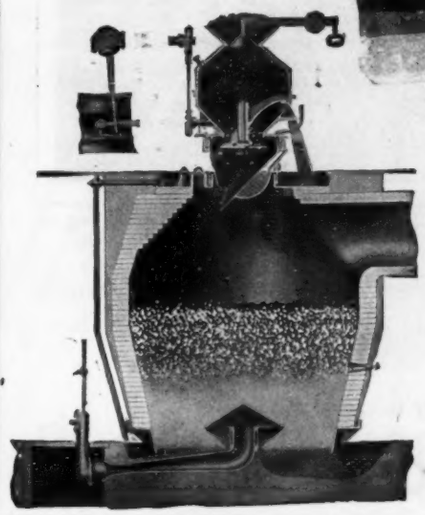
ENGINES—Mill, Reversing, Blowing, Gas, Pumping
Rolling Mills Special Machinery Hydraulic Forging Presses

WIRE MILL EQUIPMENT

Friction Driven Rod Blocks driven by coil clutches enclosed within the blocks, and equipped with Automatic Safety Stops. Designed for high efficiency and low operating and maintenance costs. No drawout mechanism required.



Rod Frame equipped with Carroll Friction Blocks.



Continuous Gas Producers

The Standard in Both Europe and the U. S.

Morgan Construction Co.

WORCESTER, MASS.

Special Specification Work
Pumping Engines
Blowing Engines
Gas Engines

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President

Large Marine Boilers to 16 feet in Diameter
Gen'l Contracting & Repair Work

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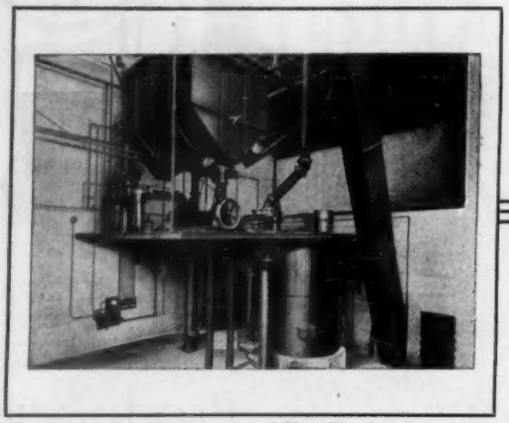

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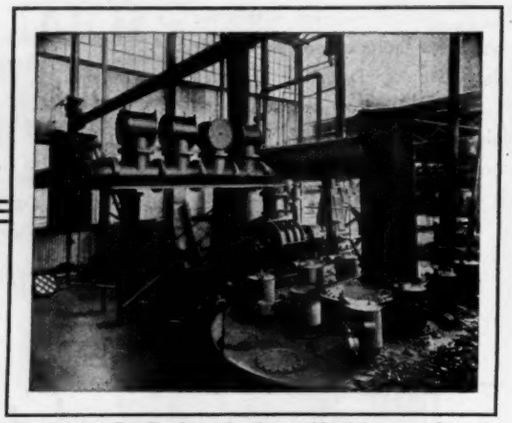

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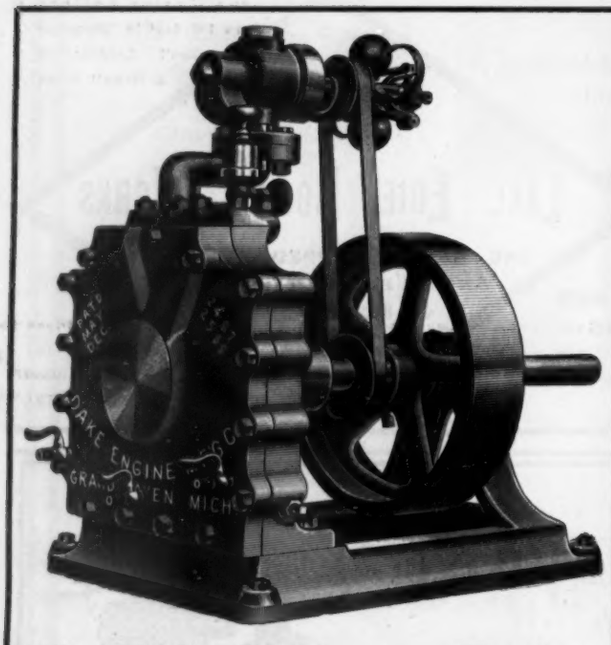

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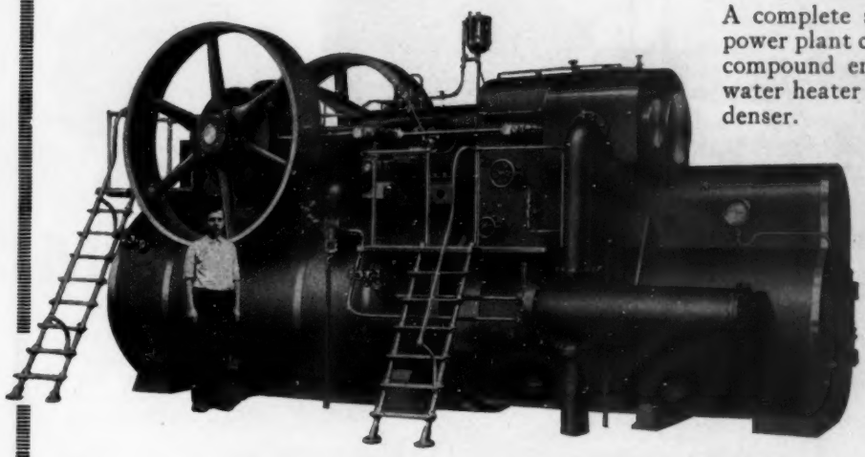

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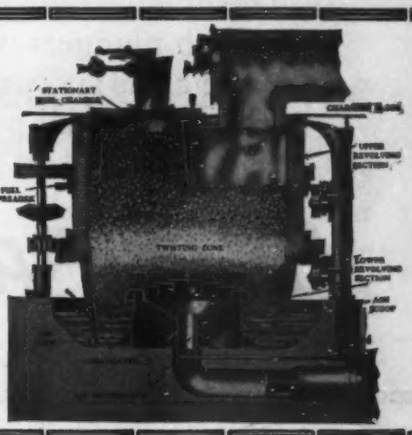

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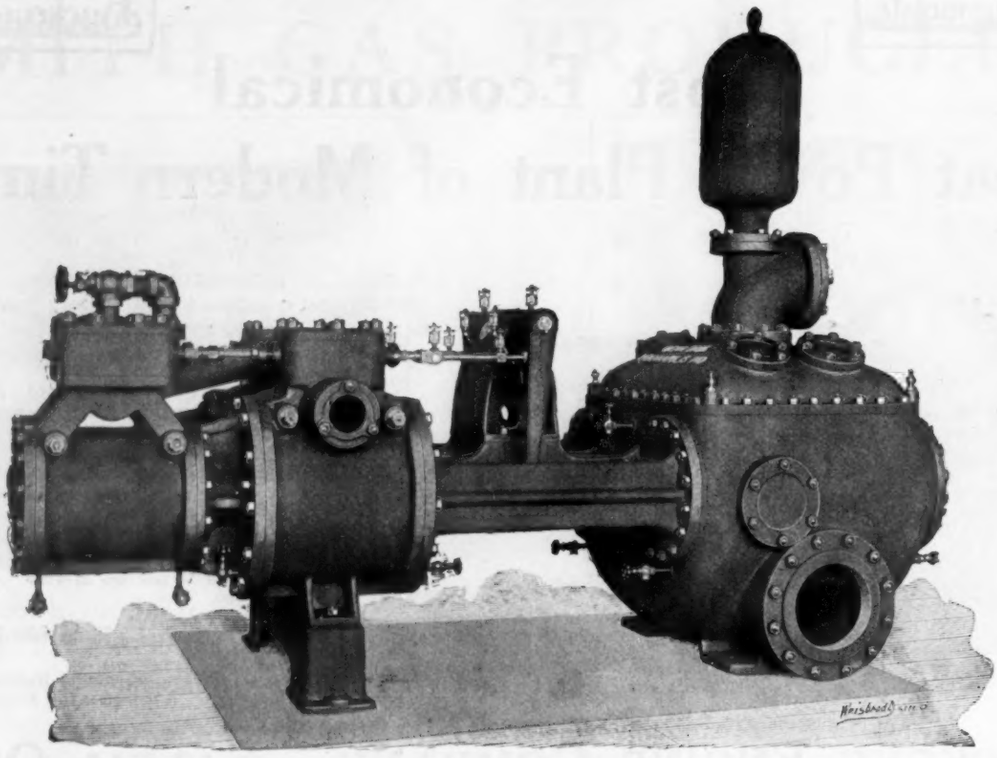

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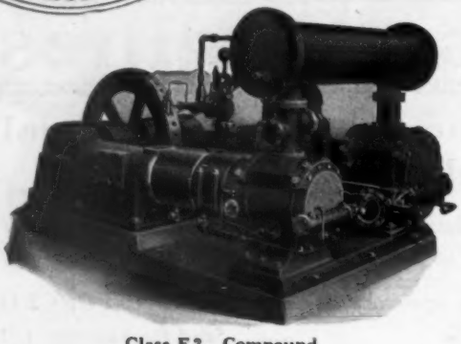

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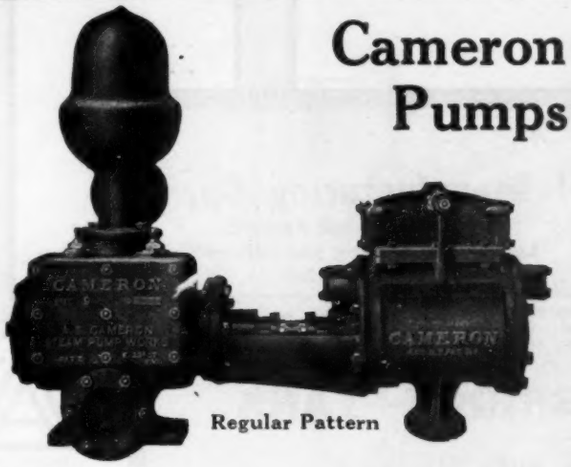

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Wm. H. Bristol Thermo-Electric Couples

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Write for this new 64-page 8 x 10½" catalog 1400-A

The Bristol Company
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Branch Offices:
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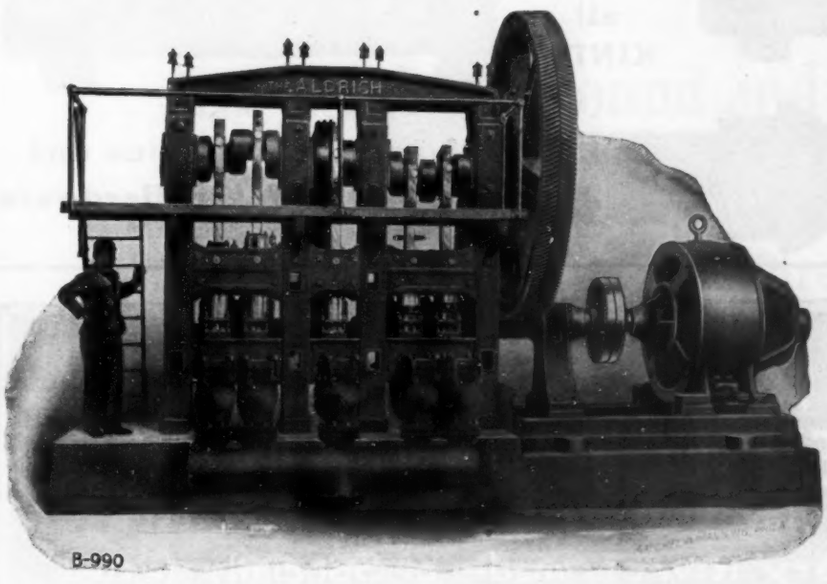
Aldrich Pumps Are Making Records—But We



appreciate more highly the many satisfied users who never fail to name the Aldrich when asked what pump to buy.

Made for every service.

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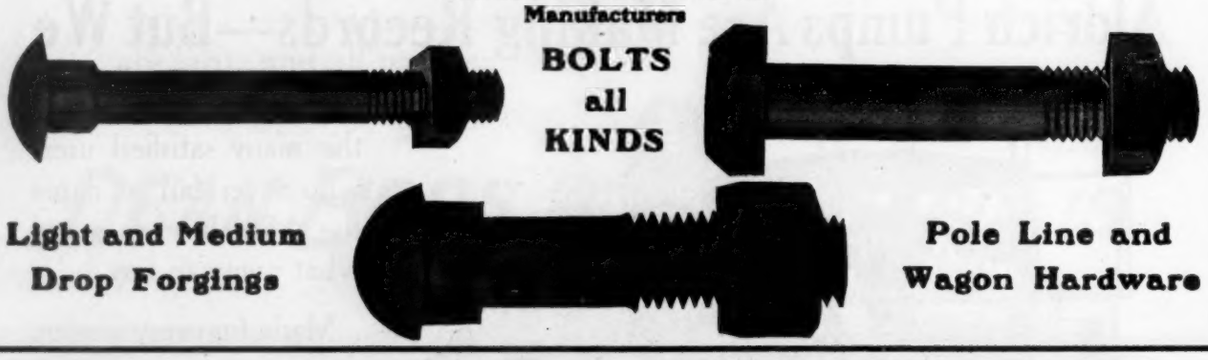

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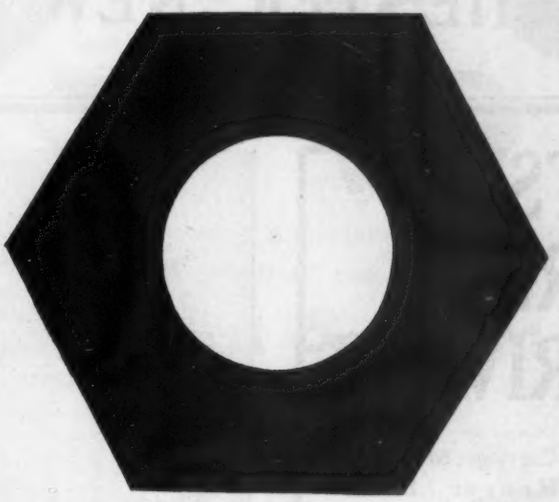

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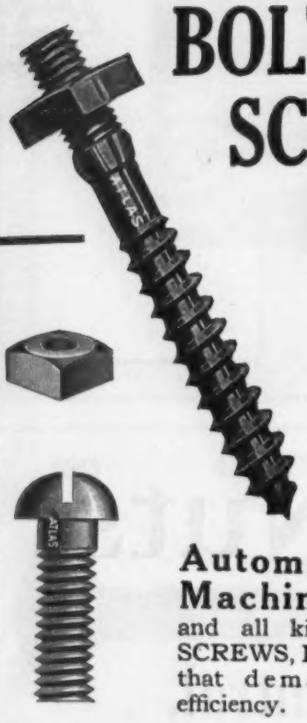

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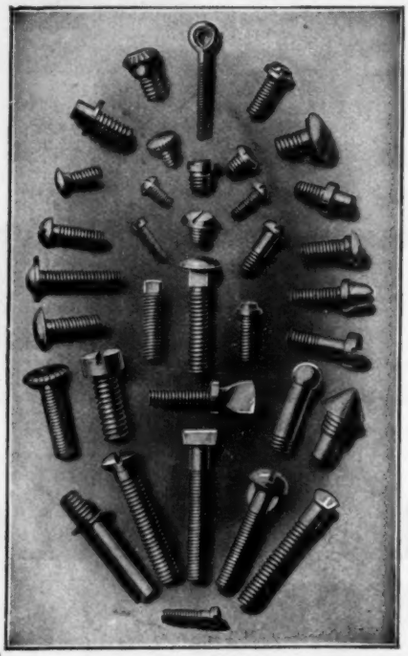

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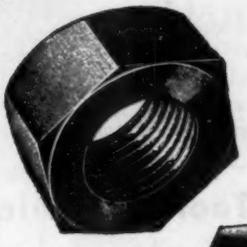

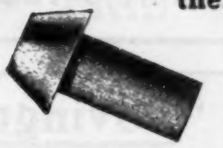

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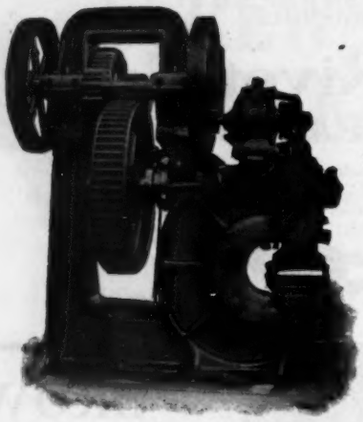

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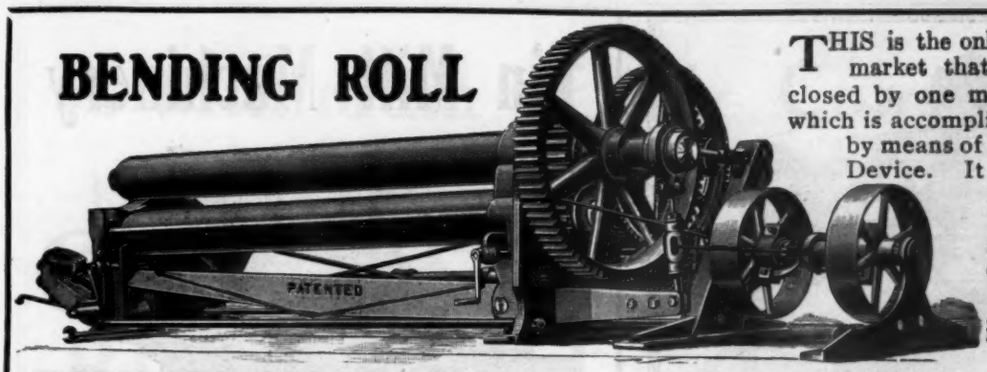

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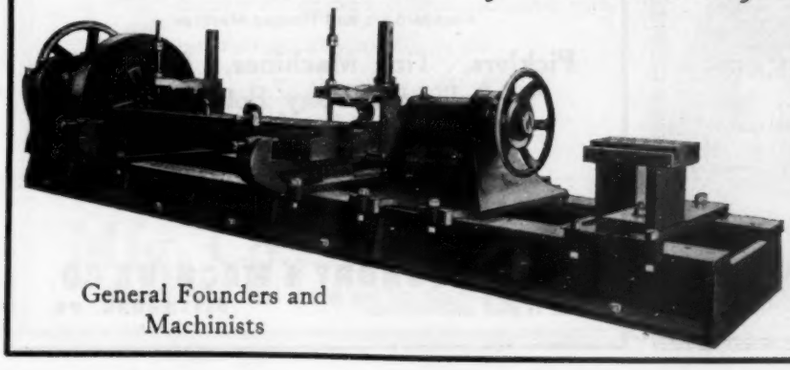

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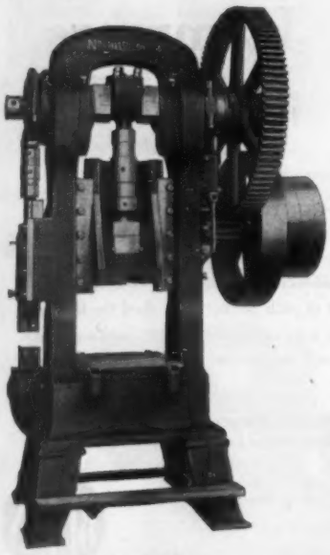
"MASSILLON" Steam Drop Hammers



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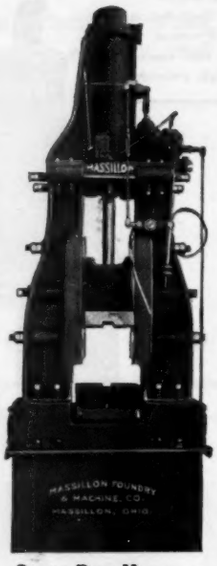

Steam Drop Hammer

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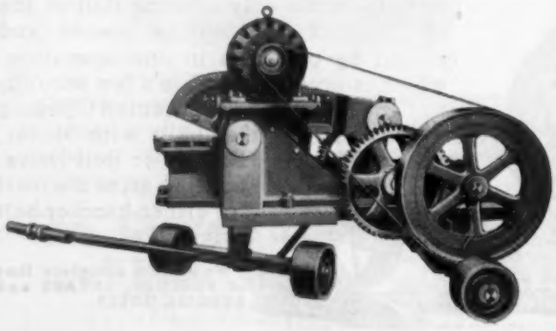

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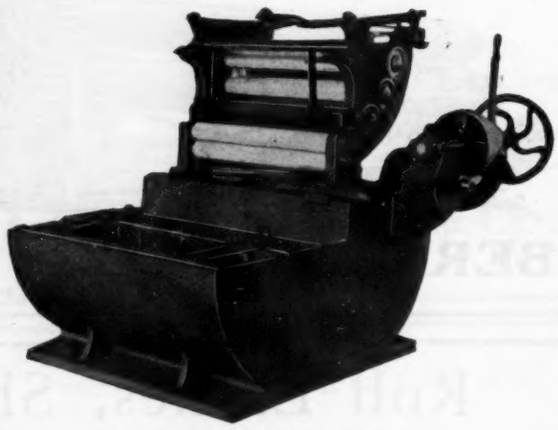

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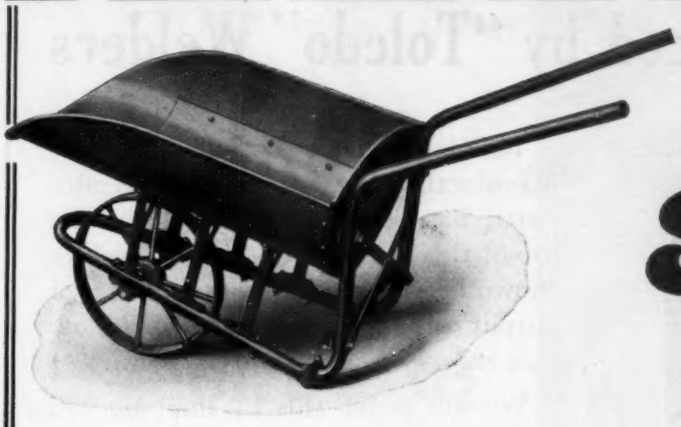

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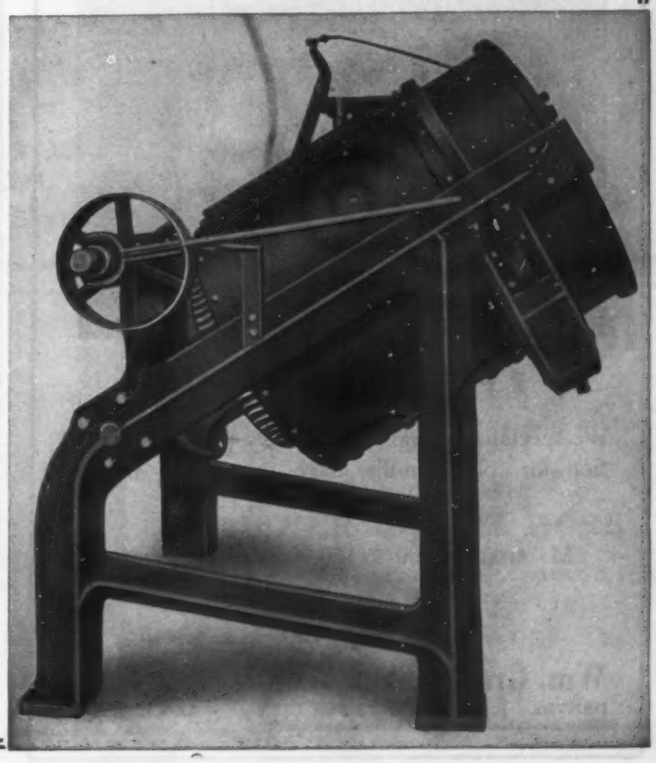

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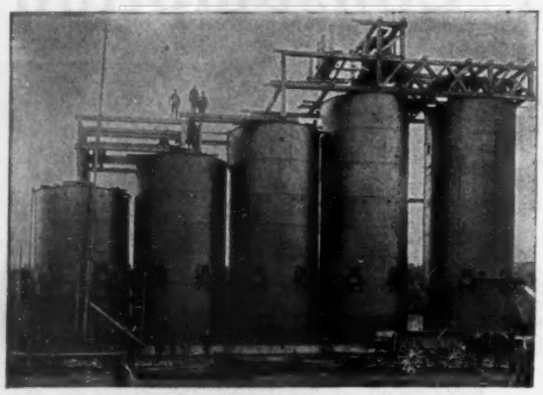

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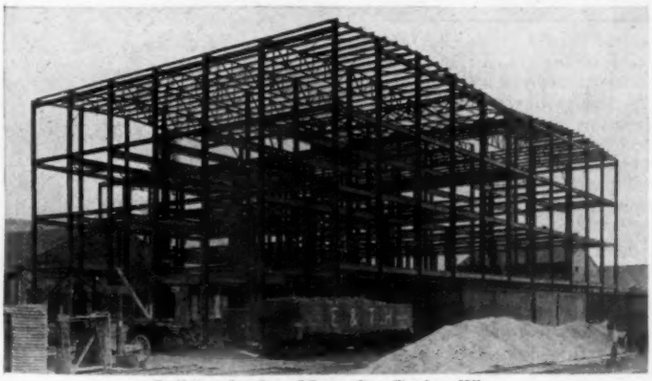

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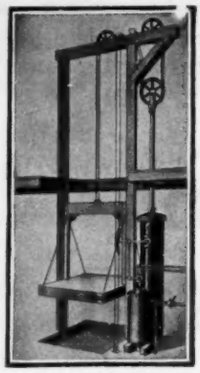

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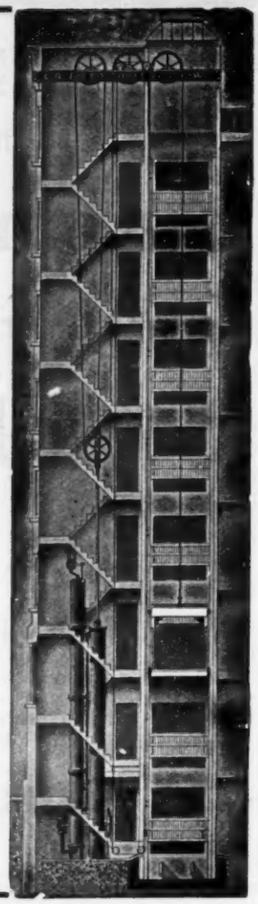

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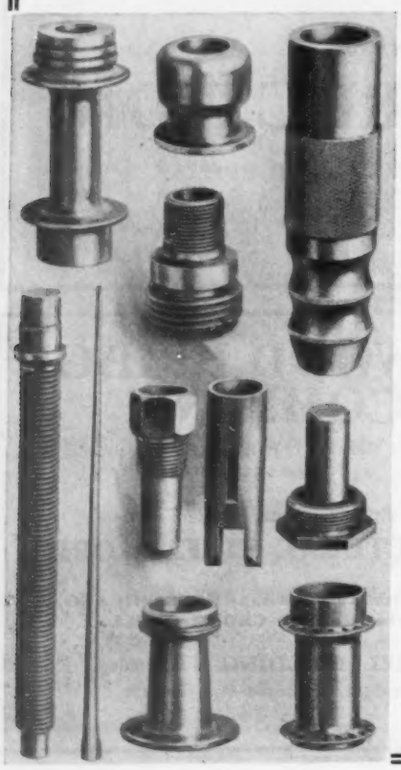

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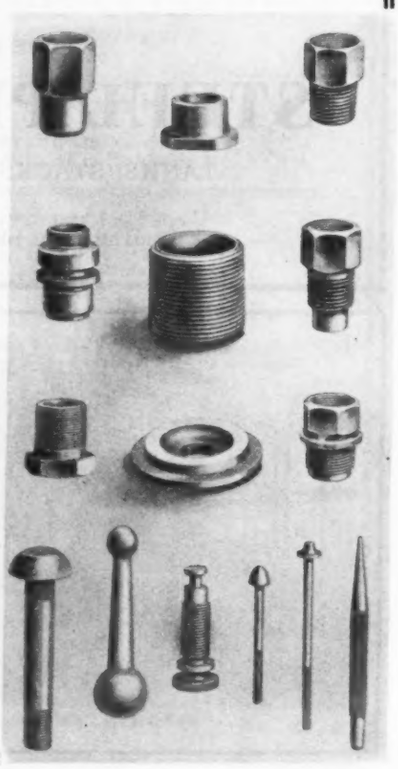

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MILWAUKEE WISCONSIN

CHIPPEWA FALLS.—The county board of supervisors awarded the contract for the construction of an 80-foot bridge over Paint Creek to the Vulcan Mfg. Co., Fond du Lac, Wis., at $35,858.

DODGEVILLE.—Nicholas Miller & Son are completing work on a farm implement manufactory costing $8,000 and are purchasing a small list of tools and other machinery. The adjoining building has been remodeled into a garage and auxiliary machine shop and is also being equipped.

FOND DU LAC.—E. M. McGowan has perfected a fender appliance for commercial and pleasure automobiles, consisting of steel band frames and lattices, and is interesting local capital in a company to own the patents and manufacture the device.

GRAND RAPIDS.—Jacobsen & Ackerman, hydraulic engineering and construction, Grand Rapids, Wis., have contracted with the Burkhardt Milling & Electric Co., Burkhardt, Wis., to build and equip a hydro-electric plant, including a dam 60 feet high, pipe lines, power house, etc., on Willow River Falls. Work will begin about April 1 and materials will be purchased after Jan. 1.

JEFFERSON.—J. T. Smith, engineer for the American Gas Construction Co., Newton, Ia., is looking over the field with a view to establishing a coal gas plant and distributing system.

LA CROSSE.—The Sterling Machinery Co., Inc., advises its new factory will be devoted to the manufacture of concrete machinery. Additional equipment will be necessary. Another plant is to be built at La Crescent, Minn., opposite La Crosse, in the near future.

MADISON.—A. W. Wellman, manufacturer of wire products, will erect a new factory building on South Paterson street and the C. & N.-W. tracks, to cost $7,500, exclusive of equipment.

MILWAUKEE.—The Milwaukee Athletic club has elected a special committee of nine to act with the board of directors, with authority to purchase a site and expend $500,000 in the construction and equipment of a new club house, which will include stores and offices. Guy F. Gregg is president.

MILWAUKEE. — The Worden-Allen Co., Milwaukee, was awarded the general contract for the construction of an addition and remodeling the main storage house of the Jos. Schlitz Brewing Co. at Milwaukee. The estimated cost is $30,000. Kirchhoff & Rose, Majestic building, are architects.

MILWAUKEE.—Earl V. Shue, of Milwaukee has organized the Shue Air Rifle Co., capital $25,000, to engage in the manufacture of pneumatic weapons and toys. A. M. Nehs and C. M. Hutchinson are associated with Mr. Shue. Plans for manufacturing have not reached a definite stage.

MILWAUKEE.—The Youghiogheny & Ohio Coal Co., Colby-Abbot building, Milwaukee, has awarded the contract for building the trestle work, overhead tracks, loading bins, hoists, cranes, electrical equipment, etc., for the new coal docks on the Menominee canal to Mead & Morrison, 53 West Jackson boulevard, Chicago. Work will begin at once.

MILWAUKEE.—The Milwaukee Realty & Securities Co. has been organized in Milwaukee to undertake the preliminary work for the construction of that part of the proposed electric railway lines of the Milwaukee-Western Electric Railway Co. running from Fox Lake to Green Lake and Beaver Dam to Madison, 74 miles. Construction work is to begin April 1.

PRAIRIE DU SAC.—M. W. Torkelson, bridge engineer for the Wisconsin State Highway Commission, is preparing plans for the proposed new $75,000 highway bridge over Wisconsin river at this point. It will be 1,400 feet long, of steel, with concrete floors. Bids will be called for after Feb. 1, 1914.

RACINE.—The Racine Pattern Works has been incorporated; $10,000; by Wenzel L. Simanek, William H. Armstrong and Joseph C. Hamata.

RACINE.—Preliminary plans and estimates are being prepared by a special committee of the Racine board of school directors for the proposed new Central High school, to cost $300,000 and be constructed during 1914.

SHEBOYGAN. — The Sheboygan Auto & Supply Co. will soon be in the market for a small list of miscellaneous power-driven tools for the new machine shop, 52 x 60 feet in size, to be erected an addition to its garage. H. F. Kade is president.

SHEBOYGAN.—H. W. Buemming, architect, 521 Jackson street, has completed plans for the new $150,000 Sheboygan city hall, and the city clerk is preparing to call for bids. F. C. Haack is chairman of the special building committee of the common council.

TRADE NOTES

BALTIMORE.—The Chesapeake Iron Works has increased its stock from $50,000 to $200,000. Half will be common and half 7 per cent cumulative preferred.

BIRMINGHAM, ALA.—The Gulf State Steel Co., which recently was incorporated under the laws of Delaware, is the successor to the Standard Steel Co., Brown-Marx building, Birmingham, Ala. President James Bowron advises that this company has acquired all the property and business at one time owned by the Southern Iron & Steel Co. and also that of the Self-Fluxing Ore Co., of Birmingham. The business, which was conducted by Mr. Bowron as trustee for the Southern Iron & Steel Co., and later in the name of the Standard Steel Co., which was a temporary corporation, now has been transferred to the permanent company under the title of the Gulf State Steel Co.. President Bowron states that the company has no plans to announce at the present time, as to additional improvements, and that any statements which have been appearing as to the proposed construction of blast furnaces, open-hearth furnaces and billet mills, are entirely unauthorized.

CANTON, O.—The Reemsnyder Spike Co., Canton, O., has changed its name to The Reemsnyder Co.

CINCINNATI.—The entire stock and machinery of the Queen City Carriage Co. will be sold at trustee's sale in bankruptcy on Dec. 29, by order of the district court for the southern district of Ohio.

MILWAUKEE.—The Davis Mfg. Co., automobile engines, has shipped a complete set of 21 tubular micrometers to the Italian government for its main naval construction yards. The company some time ago established a department for the manufacture of micrometers designed especially for naval construction work and has contracts for supplying several foreign governments.

MILWAUKEE.—The Nordberg Mfg. Co., of Milwaukee, is working on a large contract for pneumatic mining machinery for a large Canadian mining company. The contract calls for a variable capacity, two-stage air compressor, 18 x 30 x 36, and a 23 and 23 x 48 geared duplex air hoisting engine. Both machines are among the largest of the type ever constructed and will require more than two months' time for erection.

MILWAUKEE.—The new boiler and flange shop and perforating shop which the American Bridge Co. is building at West Allis for the Allis-Chalmers Mfg. Co., will be completed immediately after Jan. 1, and the transfer of the mining machinery department from the Chicago works to West Allis will be rapidly completed. The executive departments are already consolidated with the main offices at West Allis. The new buildings, two in number, have dimensions of 50 x 350 and 100 x 350 feet, respectively.

NEWPORT, KY.—The entire plant of the Dean Mfg. Co., Newport, Ky., was sold at auction on Dec. 17, by order of the Campbell circuit court of Kentucky. The sale included the plant, machine tools, foundry equipment, motors and engines. The Dean Mfg. Co., manufactured the Fox marine motor, the Dean gas and gasoline engine and also operated a gray iron foundry. The company was forced out of business by the disastrous floods last March which almost destroyed its plant, and by the dull season in the foundry business that has existed in that territory throughout the year.

RACINE.—Benjamin F. and Henry B. Fliegel, of Racine, have organized the Racine Automatic Lighting Co., capital $10,000, to build electrical systems for automobiles, motor boats, etc.

STREATOR, ILL.—S. B. Patch & Sons Co. advise that owing to the failure to buy more ground at the present location of the plant a projected additional machine shop will not be built.

WAUSAU, WIS.—A. C. Schmidt has purchased the business, stock and patents of the Milwaukee Spring Bearing Truck Co. and will transfer the business to Wausau at once, establishing a plant to produce ten times as many trucks as the Milwaukee company is now manufacturing. The trucks are designed for shop, factory, store and warehouse use.

YOUNGSTOWN, O.—The puddle mill of the Youngstown Sheet & Tube Co. has gone on double turn. Sons of Vulcan continue to hold out for union recognition.

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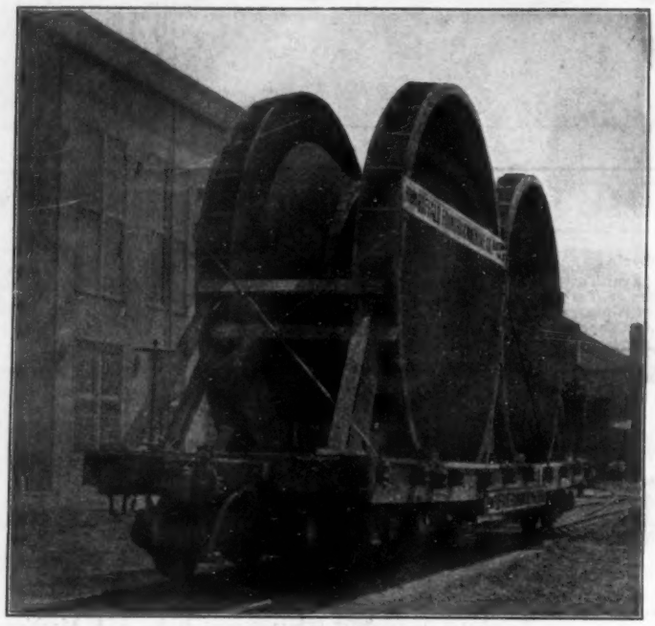

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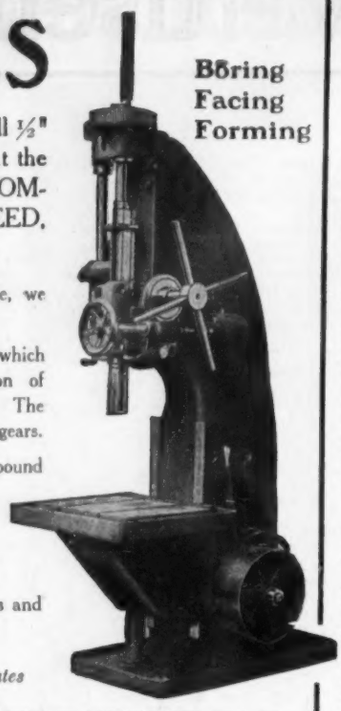

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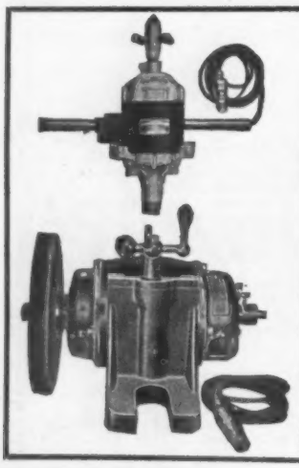

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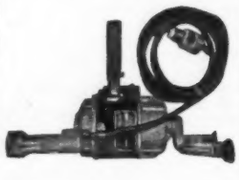

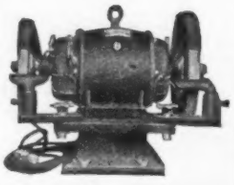

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CINCINNATI, OHIO, U. S. A.

NEW YORK OFFICE, 50 Church Street
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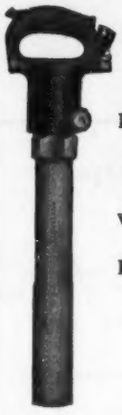
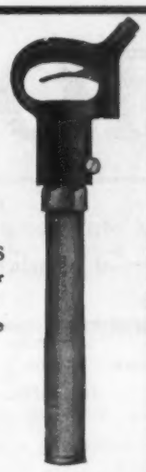


Cleveland AIR TOOLS



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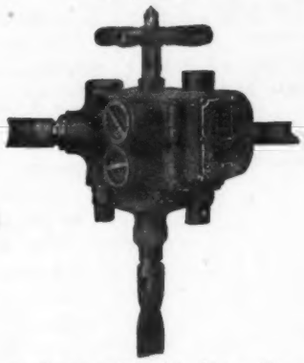
CHIPPING HAMMERS
CALKING HAMMERS
BEADING HAMMERS
With Outside and Inside Throttle Lever
BALL BEARING AIR DRILLS
Reversible and Non-Reversible
Adapted for



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Reaming

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Compound
DRILLS
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or Lever
Reverse

CORNER
DRILLS
In Two
Sizes
Nos. 38, 49

Bowes Automatic Air Hose Couplings

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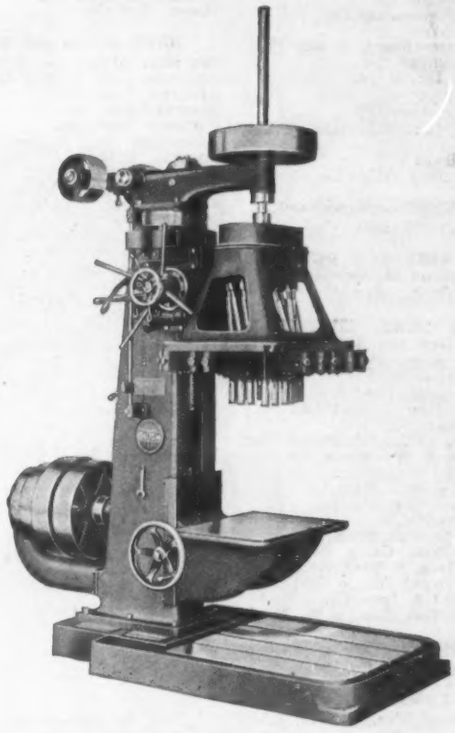

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Inland Steel Co.
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Ryerson & Son., Jos. T.
Upson Nut Co.

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Carnegie Steel Co.
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Illinois Steel Co.
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Lackawanna Steel Co.
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Pittsburgh Forge & Iron Co.

BARS.—(Wrought Iron.)
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Bourne-Fuller Co.

BEAD.—(Corner.)
Youngstown Iron & Steel Co.

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Illinois Steel Co.
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Scully Steel & Iron Co.

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Jones & Laughlin Steel Co.
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United Steel Co.
Upson Nut Co.
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Lackawanna Steel Co.
National Tube Co.
Pittsburgh Forge & Iron Co.
Tennessee Coal, Iron & R. R. Co.
Upson Nut Co.
Wood, Alan, Iron & Steel Co.
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Vulcan Iron Works.

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Cylinder and Valve Chamber Boring Machines

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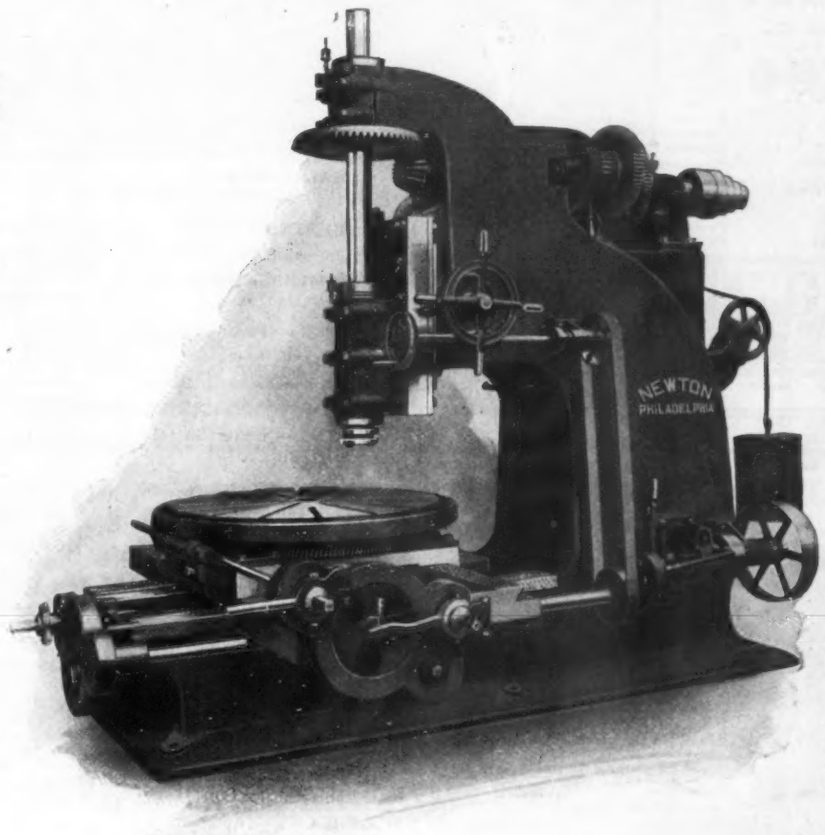

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Rail Drilling and Rail Ending Machines

Brace Milling Machines

Duplex Milling Machines

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Tod Co., Wm.

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Interstate Foundry Co.
Standard Steel Castings Co.

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Sivyer Steel Casting Co.
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Standard Steel Castings Co., The

CASTINGS.—(Gear.)
Mesta Machine Co.
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Gem Manufacturing Co.

CLEVISES.
American Bridge Co. of N. Y.

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Brier Hill Steel Co., The.
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Hillman, J. H., & Son.
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Rogers, Brown & Co.
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COAL TIPPLES.
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Hillman, J. H., & Son.
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McKeefrey & Co.
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Rogers, Brown & Co.
Samuel, Frank.
Semet-Solvay Co.
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Stone & Co., W. A.
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Mesta Machine Co.
National Brake & Elec. Co.
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Kenwood Bridge Co.
Kratzer, W. N., & Co.
Meehan Boiler & Const. Co.
Riter-Conley Mfg. Co.

CONSTRUCTION.—(Steel Plate.)
Graver Tank Works, Wm.
Struthers-Wells Co.

CONTRACTORS.—(Piping.)
Pittsburgh Piping & Equip. Co.
Pittsburgh Valve, Fdy. & Const. Co.

CONTROLLERS.—(Electric.)
Cutler-Hammer Mfg. Co.
Electric Controller & Mfg. Co.
Toledo Bridge & Crane Co.
Westinghouse Elec. Mfg. Co.

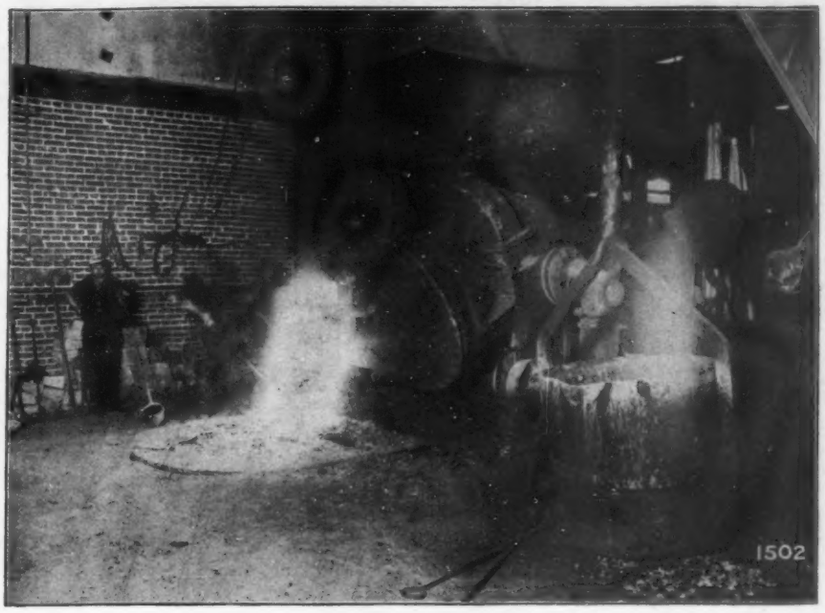
CONVERTERS.—(Steel Casting.)
Whiting Foundry Equip. Co.

CONVEYORS.
Bartlett, C. O., & Snow Co.
McMyler Interstate Co.

COUNTERSHAFTS.—(Variable Speed.)
Norton Co.

COUPLINGS.
Jones & Laughlin Steel Co.
Mark Mfg. Co.
National Tube Co.

COUPLINGS.—(Flexible.)
Electric Controller & Mfg. Co.



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The Whiting Side-Blow Converter

It tells how to make steel castings of any grade right in your own foundry and under your own supervision. With this converter you get steel castings cheaper and quicker. Not being dependent on outside sources you can plan work on orders in advance and feel sure of meeting promised shipping dates.

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Complete Foundry Plants. **Cranes of all Kinds**

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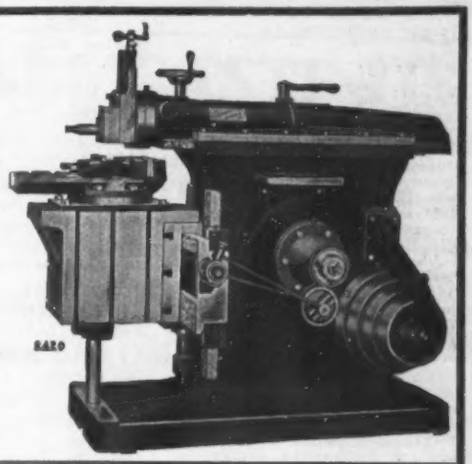
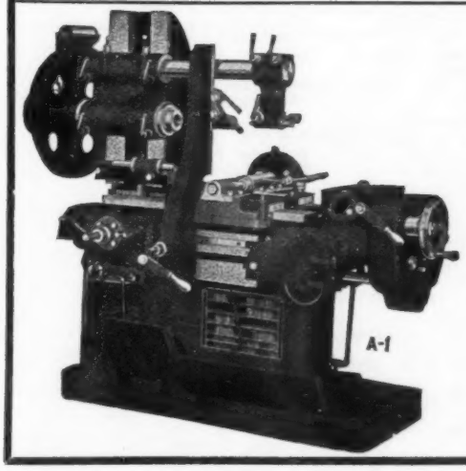
THE sum of Wear and Tear is REPAIR cost. Reduce repair cost by using the "Cincinnati" Heavy Duty Shapers. "Cincinnati" stands for accuracy, capacity, efficiency. Also, lowest upkeep expense. Ask those who use them --- they know.



THE CINCINNATI SHAPER COMPANY
CINCINNATI, OHIO



OTHER things being equal, the more POWERFUL your machine, the more and better work it will do.

And the lower the repair cost.

"Cincinnati" Gear Cutters are the most powerful of any of same rated size.

Simple, strong, dependable.

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CRANES.—(Charging.)
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Morgan Engineering Co.
Pawling & Harnischfeger Co.

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Brown Hoisting Machinery Co.
Browning Engineering Co.
Browning, Victor R., & Co.
Euclid Crane & Hoist Co.
Industrial Works.
Johnston & Jennings Co., The.
McMyler Interstate Co.
Morgan Engineering Co.
Niles-Bement-Pond Co.
Northern Engineering Works.
Pawling & Harnischfeger Co.
Ridgway, Craig, & Son.
Stamp Company, Chas. E.
Toledo Bridge & Crane Co.
Whiting Foundry Equipment Co.

CRANES.—(Gantry.)
Alliance Machine Co.
Brown Hoisting Machinery Co.
McMyler Interstate Co.
Morgan Engineering Co.
Niles-Bement-Pond Co.
Northern Engineering Works.
Pawling & Harnischfeger Co.
Toledo Bridge & Crane Co.

CRANES.—(Grab Bucket.)
Alliance Machine Co.
Brown Hoisting Machinery Co.
Industrial Works.
Niles-Bement-Pond Co.
Northern Engineering Works.
Pawling & Harnischfeger Co.
Toledo Bridge & Crane Co.
Whiting Foundry Equipment Co.

CRANES.—(Hand Traveling.)
Euclid Crane & Hoist Co.
Industrial Works.
Niles-Bement-Pond Co.
Northern Engineering Works.
Toledo Bridge & Crane Co.
Whiting Foundry Equipment Co.

CRANES.—(Hand Trolley.)
Brown Hoisting Machinery Co.

CRANES.—(Hydraulic.)
Alliance Machine Co.
Morgan Engineering Co.

CRANES.—(Ingot Stripper.)
Alliance Machine Co.
Morgan Engineering Co.
Pawling & Harnischfeger Co.

CRANES.—(Jib.)
Alliance Machine Co.
Brown Hoisting Machinery Co.
Industrial Works.
McMyler Interstate Co.
Morgan Engineering Co.
Niles-Bement-Pond Co.
Northern Engineering Works.
Pawling &Harnischfeger Co.
Ridgway, Craig, & Son.
United Engrg. & Fdy. Co.
Whiting Foundry Equipment Co.

CRANES.—(Locomotive.)
Brown Hoisting Machinery Co.
Browning Engineering Co.
Industrial Works.
McMyler Interstate Co.
Morgan Engineering Co.
Northern Engineering Works.
Wellman-Seaver-Morgan Co.

CRANES.—(Pneumatic.)
Detroit Hoist & Machinery Co.
Industrial Works.
Northern Engineering Works.

CRANES.—(Portable.)
Canton Fdy. & Mach. Co.

CRANES.—(Special.)
Alliance Machine Co.
Brown Hoisting Machinery Co.
Euclid Crane & Hoist Co.
Industrial Works.
McMyler Interstate Co.
Morgan Engineering Co.
Northern Engineering Co.
Shaw Electric Crane Co.
United Engrg. & Fdy. Co.

CRANES.—(Steam and Pneumatic, Wire Mills.)
Turner, Vaughn & Taylor Co.

CRANK SHAFTS.
Kropp Forge Co.

CRUCIBLES.
Dixon, Joseph, Crucible Co.

CUPOLAS.
Northern Engineering Works.
Whiting Foundry Equipment Co.

CUTTERS.
Landis Tool Co.
Mark Mfg. Co.

CUTTERS.—(Milling.)
Morse Twist Drill & Mch. Co.

CUTTING.—(Oxy-Acetylene Process.)
International Oxygen Co.
Oxweld Acetylene Co.

CYLINDERS.
National Tube Co.

DERRICKS.
American Bridge Co. of N. Y.
Dake Engine Co.

DIES.
Gem Manufacturing Co.
Jones & Lamson Mach. Co.
Landis Machine Co.
Mark Mfg. Co.
Toledo Machine & Tool Co.

DIE-PLATES AND WORLDES. (Steel Wire Mills.)
Turner, Vaughn & Taylor Co.

DOCKS.—(Ore.)
American Bridge Co. of N. Y.

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Bucyrus Co.
Thew Automatic Shovel Co.

DRESSERS.—(Emery Wheel.)
Norton Co.

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Cincinnati Electrical Tool Co.
U. S. Electrical Tool Co.
Van Dorn & Dutton Co.

DRILLS.—(Pneumatic.)
Allen, John F., Co.
Cleveland Pneumatic Tool Co.

DRILLS.—(Portable.)
Newton Mach. Tool Works, Inc.
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Morse Twist Drill & Machine Co.
Ryerson, Jos. T., & Son.

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Industrial Works.

DYNAMOS.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

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Asbestos Protected Metal Co.
Ayer & Lord Tie Co.
Bellefontaine Bridge & Steel Co.
Blair Engineering Co.
Carroll Foundry & Machine Co.
Champion Iron Co.
Garrett-Tilley Co., Inc.
Hartman, W. E.
Kenwood Bridge Co.
Ladd, James B.
Lake Erie Engineering Works.
Laughlin, Alex., & Co.
McClintic-Marshall Co.
McClure, Geo. W., Son & Co.
McKee, Arthur G.
Mesta Machine Co.
Morgan Engineering Co.
Ohio Wood Preserving Co.
Pittsburgh Wood Preserving Co.
Shaw-Kendall Engineering Co.
Smythe, The S. R. Co.
Swindell, Wm., & Bros.
Tod Co., Wm.
Turner, Vaughn & Taylor Co.
Union Fdy. & Mach. Co.
United Engineering & Fdy. Co.
Wellman-Seaver-Morgan Co.
Woodmansee & Davidson, Inc.

ENGINEERS AND CONTRACTORS.—(By-Product Coke Ovens.)
Gas Machinery Co., The.
Hartman, W. E.
United Coke & Gas Co.

ENGINES.—(Blowing.)
Hooven, Owens, Rentschler Co.
Mackintosh, Hemphill & Co.
Tod Co., Wm.

ENGINES.—(Corliss.)
Cooper, C. & G., Co.
Mesta Machine Co.

ENGINES.—(Gas, Gasoline and Oil.)
Buckeye Engine Co.
Cooper, C. & G., Co.
Mesta Machine Co.
Struthers-Wells Co.
Tod Co., Wm.

ENGINES.—(Hoisting.)
Dake Engine Co.
Lyons-Atlas Co.
Vulcan Iron Works.

ENGINES.—(Pneumatic.)
Detroit Hoist & Machine Co.

ENGINES.—(Pumping.)
Hooven, Owens, Rentschler Co.
Tod Co., Wm.

ENGINES.—(Reversing.)
Mesta Machine Co.

ENGINES.—(Steam.)
Buckeye Engine Co.
Cooper, C. & G., Co.
Dake Engine Co.
Hooven, Owens, Rentschler Co.
Lake Erie Engineering Works.
Mackintosh, Hemphill & Co.
Struthers-Wells Co.
Tod Co., Wm.
Vulcan Iron Works.

EQUIPMENT.—(Lighting Plant.)
Smith Gas Power Co., The.

EQUIPMENT.—(Railway.)
Hyman-Michaels Co.

EQUIPMENT.—(Rolling Mill.)
Bertsch & Co.
Carroll Foundry & Machine Co.
Mackintosh, Hemphill & Co.
Mesta Machine Co.
Morgan Engineering Co.
Tod Co., Wm.
United Engineering & Fdy. Co.

EQUIPMENT. — (Welded Chain, Wire and Wire Nail Mills—Complete.)
Turner, Vaughn & Taylor Co.

EYEBARS.
American Bridge Co. of N. Y.

EXTRACTORS.—(Tar.)
Smith Gas Power Co., The.

FACINGS.—(Foundry.)
Dixon, Jos., Crucible Co.

FENCING.
American Steel & Wire Co.
Cambria Steel Co.
Champion Iron Co.
Youngstown Sheet & Tube Co.

FERRO ALLOYS.—(Metals, Welders.)
Goldschmidt Thermit Co.

FERRO-MANGANESE.
Blackwell, Geo. G., & Sons, Ltd.
Crocker Bros.
Mohr, J. J., & Son.
Pickands, Brown & Co.
Rogers, Brown & Co.
Samuel, Frank.

FERRO-SILICON.
Blackwell, Geo. G., & Sons, Ltd.
Crocker Bros.
Mohr, J. J., & Son.
Pickands, Brown & Co.
Rogers, Brown & Co.
Samuel, Frank.
Tennessee Coal, Iron & R. R. Co.

FILES.
Barnett, G. & H., Co.
Disston & Sons, Inc., Henry.
Nicholson File Co.

FITTINGS.—(Pipe.)
Illinois Malleable Iron Co.
National Tube Co.
Pittsburgh Piping & Equip. Co.
Pittsburgh Valve, Fdy. & Const. Co.
United Engrg. & Fdy. Co.

FLANGES.
Dart, E. M., Mfg. Co.
Hubbard Steel Foundry Co.
National Tube Co.

FLASKS.
Sterling Wheelbarrow Co.

FLOORING.—(Bridge.)
Youngstown Iron & Steel Co.

FLOORING.—(Creosoted Wood.)
Ayer & Lord Tie Co.
Ohio Wood Preserving Co.
Pittsburgh Wood Preserving Co.

FLUOR-SPAR.
Rogers, Brown & Co.

FLY WHEELS.
Jones & Laughlin Steel Co.
Mesta Machine Co.
Tod Co., Wm.

FORGINGS.
American Bridge Co. of N. Y.
American Iron & Steel Mfg. Co.
Anderson Forge & Mach. Co.
Bethlehem Steel Co.
Carnegie Steel Co.
Champion Machine & Forging Co.
Cleveland City Forge & Iron Co.
Columbus Forge & Iron Co.
Crucible Steel Forge Co.
Eccles Co., Richard.
Horsburgh Forging Co.
Ingalls-Shepard Forging Co.
Jones & Laughlin Steel Co.
Kropp Forge Co.
Martin Forging Co., H. J.
Otis Steel Co.
Pollak Steel Co.
Rockford Drop Forge Co.
Steel Car Forge Co.

FORGINGS.—(Auto.)
Anderson Forge & Mach. Co.
Cleveland City Forge & Iron Co.
General Drpp Forge Co.
Kropp Forge Co.
Martin Forging Co., H. J.

FORGINGS.—(Car and Locomotive.)
American Iron & Steel Mfg. Co.
Andrews Steel Co.
Cambria Steel Co.
Cleveland City Forge & Iron Co.
Oliver Iron & Steel Co.
Steel Car Forge Co.

FORGINGS.—(Copper and Alloy Steel.)
Anderson Forge & Mach. Co.
Kropp Forge Co.
Martin Forging Co., H. J.

FORGINGS.—(Drop.)
Anderson Forge & Mach. Co.
Champion Machine & Forging Co.
Cleveland City Forge & Iron Co.
Columbus Forge & Iron Co.
General Drop Forge Co.
Ingalls-Shepard Forging Co.
Martin Forging Co., H. J.
Oliver Iron & Steel Co.
Rockford Drop Forge Co.
Steel Car Forge Co.
Western Drop Forge Co.

FOUNDRY EQUIPMENT AND SUPPLIES.—(Iron and Brass.)
Arcade Mfg. Co.
Kelly, T. P., & Co.
Northern Engineering Works.
Ohio Wood Preserving Co.
Paxson, J. W., Co.
Pittsburgh Wood Preserving Co.
Sly Mfg. Co., W. W.
Sterling Wheelbarrow Co.
Whiting Foundry Equipment Co.

FURNACES.—(Annealing.)
Garrett-Tilley Co., Inc.
Hagan, Geo. J.
Kenworthy, Chas. F.
Quigley Furnace & Fdy. Co.
Swindell & Bros., Wm.

FURNACES.—(Billet and Plate Heating.)
Kenworthy, Chas. F.
Quigley Furnace & Foundry Co.

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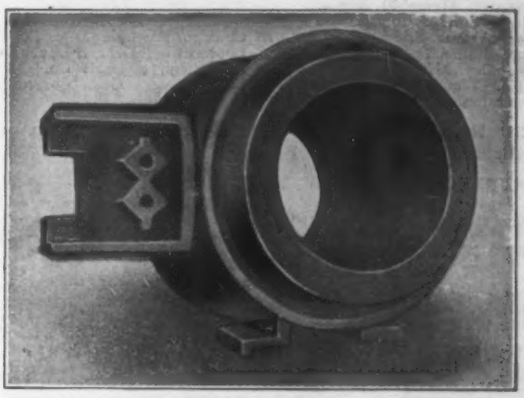
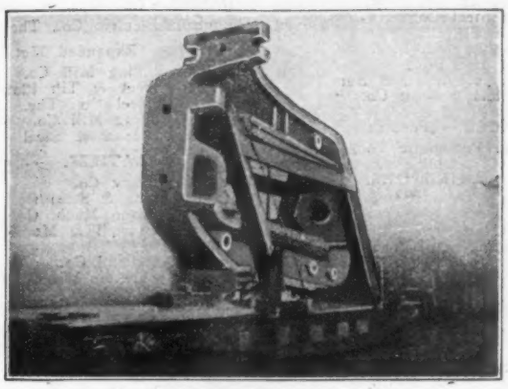
There is nothing too large for us to make STEEL CASTINGS from 100 to 100,000 pounds



29,000 Pounds



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Otis Fire-Box Plates a Specialty. Flange Plates, Ship Plates, Tank Plates, Steel Axles of all kinds

Steel Castings and Forgings

The Otis Steel Company

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Detroit —George W. House, Ford Building
Birmingham, Ala.,—Carpenter & Hillman

National Foundry Co.

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STEEL CASTINGS

Also Gray Iron Castings

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STEEL CASTINGS

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40 Tons Down

THE CANTON STEEL FOUNDRY CO.

CANTON, OHIO

The WEST STEEL CASTING CO.

SMALL STEEL CASTINGS

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Special Dynamo Steel for Electric Castings

West Michigan Steel Foundry Co.

Service and Quality Unexcelled

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Pratt & Letchworth Company

Established 1848

Steel CASTINGS Malleable

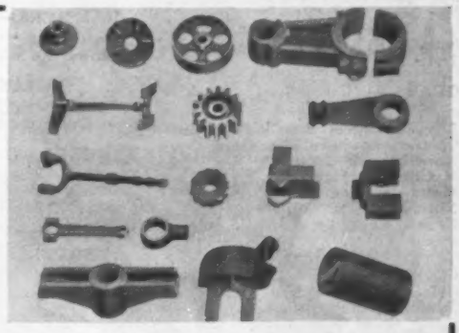
Annual Capacity.
70,000 Tons

BUFFALO, NEW YORK

Steel Castings

1 to 100 pounds

We compete in price and quality.



JEWELL STEEL & MALLEABLE CO.

BUFFALO, N. Y.

FURNACES.—(Blast.)
Ladd, James B.
Lake Erie Engrg. Works.
Mackintosh, Hemphill & Co.
McClure, Son & Co., G. W.
McKee, Arthur G.
Meehan Boiler & Const. Co.
Riter-Conley Mfg. Co.
Tod Co., Wm.
Wellman-Seaver-Morgan Co.

FURNACES.—(Crucible.)
Laughlin & Co., Alex.

FURNACES.—(Forging.)
Kenworthy, Chas. F.
Quigley Furnace & Foundry Co.

FURNACES.—(Heat Testing.)
Best, W. N.
Garrett-Tilley Co., Inc.
Kenworthy, Chas. F.
Quigley Furnace & Foundry Co.

FURNACES. — Lead, Pot and Muffle Annealing, Wire Mills.)
Turner, Vaughn & Taylor Co.

FURNACES.—(Melting.)
Best, W. N.
Whiting Foundry Equip. Co.

FURNACES.—(Oil, Gas or Coke, Welding Chain Factories.)
Turner, Vaughn & Taylor Co.

FURNACES.—(Open-Hearth.)
Smythe Co., S. R.

FURNACES.—(Reheating.)
Morgan Construction Co.

FURRING.—(Metal.)
Youngstown Iron & Steel Co.

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Cleveland Galvanizing Wks. Co.
McCance Bros. Co.

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Esbestos Brake Lning Co.

GAGES.—(Recording and Steam.)
Bristol Co.
Brown Instrument Co.

GEAR CUTTING.
Bilgram Machine Works.
Newton Machine Tool Works.
Tod Co., Wm.

GEARS.
Allen, Edgar, American Manganese Steel Co.
Bucyrus Steel Casting Co.
Chicago Rawhide Mfg. Co.
Dake Engine Co.
Farrell Fdy. & Mach. Co.
Fawcus Machine Co.
Foote Bros. Gear & Mach. Co.
Horsburgh & Scott Co.
Mackintosh, Hemphill & Co.
Mesta Machine Co.
New Process Gear Corpn.
Nuttall, R. D., Co.
Taylor-Wharton Iron & Steel Co.
Tod Co., Wm.
Union Foundry & Machine Co.
United Engrg. & Fdy. Co.
Van Dorn & Dutton Co.

GEARS.—(Bevel.)
Chicago Rawhide Mfg. Co.
Fawcus Machine Co.
Horsburgh & Scott Co.
New Process Gear Corpn.
Nuttall, R. D., Co.
Tod Co., Wm.

GEARS. — (Cast Steel, Machine Molded.)
American Steel Foundries.
Chicago Rawhide Mfg. Co.
Horsburgh & Scott Co.
Mackintosh, Hemphill & Co.
Mesta Machine Co.
Nuttall, R. D., Co.
United Engrg. & Fdy. Co.

GEARS.—(Cut.)
Carroll Foundry & Machine Co.
Chicago Rawhide Mfg. Co.
Fawcus Machine Co.
Foote Bros. Gear & Mach. Co.
Horsburgh & Scott Co.
Mesta Machine Co.
New Process Gear Corpn.
Nuttall, R. D., Co.
Tod Co., Wm.
Van Dorn & Dutton Co.

GEARS.—(Double Helical Cut.)
Fawcus Machine Co.
Tod Co., Wm.

GEARS.—(Rawhide.)
Chicago Rawhide Mfg. Co.
Foote Bros. Gear & Mach. Co.
Horsburgh & Scott Co.
New Process Gear Corpn.
Nuttall, R. D., Co.

GENERATORS.—(Direct and Alternating.)
Crocker-Wheeler Co.
General Electric Co.
Westinghouse Elec. & Mfg. Co.

GRAPHITE.
Dixon, Jos., Crucible Co.

GRATES.
Green Engrg. Co.

GRINDERS.—(Chain Die, Welded Chain Factories.)
Turner, Vaughn & Taylor Co.

GRINDERS.—(Electrical Driven.)
Cincinnati Electrical Tool Co.
United States Electrical Tool Co.

GRINDERS. — (Nail Machine, Knife, Wire Nail Mills.)
Turner, Vaughn & Taylor Co.

GRINDERS.—(Pneumatic.)
Cleveland Pneumatic Tool Co.

HAMMERS.—(Belt-Driven.)
Beaudry & Co., Inc.
Bradley & Son, C. C.

HAMMERS.—(Drop.)
Alliance Machine Co.
Bliss, E. W., Co.
Buffalo Fdy. & Machine Co.
Chambersburg Engineering Co.
Erie Foundry Co.
Massillon Fdy. & Machine Co.
Morgan Engineering Co.
Niles-Bement-Pond Co.
Toledo Machine & Tool Co.
United Engineering & Foundry Co.

HAMMERS.—(Foot and Power, Welded Chain Factories.)
Turner, Vaughn & Taylor Co.

HAMMERS.—(Drop Forging.)
Buffalo Foundry & Machine Co.
Toledo Machine & Tool Co.

HAMMERS.—(Pneumatic.)
Cleveland Pneumatic Tool Co.
Ryerson, Joseph T., & Son.

HAMMERS.—(Power.)
Beaudry & Co., Inc.
Bradley & Son, C. C.
Buffalo Fdy. & Mach. Co.
Cleveland Punch & Shear Works Co.
Massillon Fdy. & Mach. Co.
Morgan Engineering Co.
Toledo Machine & Tool Co.

HAMMERS.—(Steam.)
Buffalo Fdy. & Mach. Co.
Chambersburg Engineering Co.
Erie Foundry Co.
Massillon Foundry & Machine Co.
Morgan Engineering Co.
Niles-Bement-Pond Co.

HAMMERS.—(Steam Gravity Drop.)
Massillon Foundry & Machine Co.

HANGERS.
Jones & Laughlin Steel Co.
New Departure Mfg. Co.

HANGERS.—(Lamp Cut-Outs.)
Thompson Electric Co., The.

HEADS.—(Dished.)
Worth Bros.

HEATERS.—(Feed Water.)
Shaw-Kendall Engineering Co.

HOISTS.—(Chain.)
Chisholm & Moore Mfg. Co.
Dake Engine Co.

HOISTS.—Compressed Air Geared.)
Dake Engine Co.
Detroit Hoist & Machine Co.

HOISTS.—(Electric.)
Alliance Machine Co.
Browning Engineering Co.
Browning, Victor R., & Co.
Euclid Crane & Hoist Co.
Mead-Morrison Mfg. Co.
Morgan Engineering Co.
Niles-Bement-Pond Co.
Northern Engineering Works.
Otis Elevator Co.
Pawling & Harnischfeger Co.
Toledo Bridge & Crane Co.
Whiting Foundry Equipment Co.

HOISTS.—(Pneumatic.)
Dake Engine Co.
Detroit Hoist & Machine Co.
Northern Engineering Works.
Ridgway, Craig, & Son.
Whiting Foundry Equipment Co.

HOISTS.—(Portable.)
Canton Fdy. & Mach. Co.

HOOPS AND BANDS.
American Steel & Wire Co.
Bourne-Fuller Co., The.
Carnegie Steel Co.
Illinois Steel Co.
Jones & Laughlin Steel Co.
McCance Bros. Co.
Ryerson, Joseph T., & Son.
Scully Steel & Iron Co.

HOSE.—(Pneumatic.)
Cleveland Pneumatic Tool Co.

INJECTORS.
Watson, N. A.

INSTRUMENTS.—(Electric, Indicating and Recording.)
Bristol Co.
Brown Instrument Co.
Smith Gas Power Co.

IRON. — (Basic—Bessemer—Malleable.)
Inland Steel Co.
Pickands, Brown & Co.

IRON.—(Cutting Apparatus.)
Newton Mach. Tool Works, Inc.

IRON.—(Pig.)
Baird & West.
Bourne-Fuller Co., The.
Brier Hill Steel Co.
Carnegie Steel Co.
Columbus Iron & Steel Co.
Crocker Bros.
Domhoff & Joyce Co., The.
Eaton, Rhodes & Co.
Globe Iron Co.
Hanna & Co., M. A.
Hillman & Son, J. H.
Illinois Steel Co.
La Belle Iron Works.
McKeefrey & Co.
Mitchell-Diggins Iron Co.
Mohr, J. J., & Son.
Pickands, Brown & Co.
Pickands, Mather & Co.
Republic Iron & Steel Co.
Rogers, Brown & Co.
Samuel, Frank.
Snyder & Co., W. P.
Stewart Iron Co., Ltd.
Superior Charcoal Iron Co.
Tenn. Coal, Iron & R. R. Co.
Thomas Furnace Co.
Upson Nut Co.

IRON.—(Staybolt.)
American Iron & Steel Mfg. Co.
Bourne-Fuller Co., The.

IRON AND STEEL.—Galvanized.)
American Rolling Mill Co.
American Sheet & Tin Plate Co.
Bourne-Fuller Co., The.
Brier Hill Steel Co.
Inland Steel Co.
McCalla, Harold
Newport Rolling Mill Co.
Portsmouth Steel Co.
Ryerson, Jos. T., & Son.
Youngstown Sheet & Tube Co.

IRON AND STEEL.—(Scrap.)
American Bridge Co. of N. Y.
Hyman-Michaels Co.

IRON AND STEEL.—(Swedish.)
Bourne-Fuller Co., The.
Scully Steel & Iron Co.

JACKS.—(Hydraulic.)
Watson-Stillman Co.

JOINTS.—(Rail.)
Carnegie Steel Co.
Lackawanna Steel Co.

KEYS AND COTTERS.—(Machine.)
Standard Gauge Steel Co.

KEYSEATERS.
Baker Bros.
Milton & Merrill.

LABORATORY WORK.
Metallurgical Testing Laboratories Co.

LADLES.
Elec. Locomotive & Car Co.
Northern Engineering Works.
Riter-Conley Mfg. Co.
Whiting Foundry Equipment Co.

LAMPS.—(Arc.)
Westinghouse Elec. & Mfg. Co.

LAMPS.—(Incandescent.)
Westinghouse Elec. & Mfg. Co.

LAMPS.—(Cut-Out Hangers.)
Thompson Electric Co., The.

LATH.—(Expanded Metal.)
American Rolling Mill Co.
American Sheet & Tin Plate Co.
Brier Hill Steel Co., The.
Newport Rolling Mill Co.
Youngstown Iron & Steel Co.

LATHES.
Baird Machinery Co.
Cincinnati Iron & Steel Co.
Jones & Lamson Mach. Co.
Manning, Maxwell & Moore, Inc.
McCabe, J. J.
Niles-Bement-Pond Co.
Potter & Johnston Mach. Co.

LATHES.—(Automatic Turret.)
Potter & Johnston Mach. Co.

LATHES.—(Roll.)
Mesta Machine Co.
Youngstown Fdy. & Mch. Co.

LATHES.—(Turret.)
Jones & Lamson Mach. Co.
New Britain Mach. Co.
Potter & Johnston Mach. Co.

LINE MATERIAL. — (Telegraph and Telephone.)
Inland Steel Co.
National Tube Co.

LINING.—(Brake.)
Erbestos Brake Lining Co.

LININGS.—(Cupola.)
Louisville Fire Brick Works.

LINING.—(Forge and Furnace.)
Harbison-Walker Refractories Co.

LOCOMOTIVES.—(Electric.)
Atlas Car & Mfg. Co.
General Electric Co.
Westinghouse Electric & Mfg. Co.

LOCOMOTIVES.—(Industrial.)
Vulcan Iron Works.

LUMBER. — (Boxing, Crating, Flask and Pattern.)
Johnson Lumber Co.

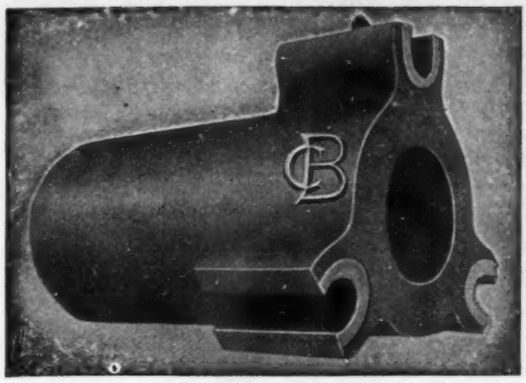
LUMBER.—(Creosoted.)
Ayer & Lord Tie Co.
Ohio Wood Preserving Co.
Pittsburgh Wood Preserving Co.

MACHINERY.—(Automatic Chucking.)
Potter & Johnston Mach. Co.

MACHINERY.—(Automatic Gear Cutting.)
Cincinnati Gear Cutting Mch. Co.
Newton Mach. Tool Works, Inc.

MACHINERY. — (Barb Wire Fence, Barb Nail Wire, Wire Mills.)
Turner, Vaughn & Taylor Co.

MACHINERY. — (Bending and Straightening.)
Bertsch & Co.
Birdsboro Steel Fdy. & Mach. Co.
Cleveland Punch & Shear Works Co.
Covington Machine Co.
Espen-Lucas Machine Works.
Mackintosh, Hemphill & Co.
Morgan Engineering Co.
United Engineering & Fdy. Co.
Watson-Stillman Co.



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Waterburry Farrell Fdy. & Mch. Co.
Williams Tool Co.

MACHINERY. — (Boring and Turning.)
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Cincinnati Planer Co.
Espen-Lucas Machine Works.
McCabe, J. J.
Mitts & Merrill.
Newton Mach. Tool Works, Inc.
Niles-Bement-Pond Co.
Warner & Swasey Co.

MACHINERY.—(Cement.)
Vulcan Iron Works.

MACHINERY.—(Coil and Trace Chain, Welded Chain Factories.)
Turner, Vaughn & Taylor Co.

MACHINERY.—(Coke Oven.)
Gas Machinery Co., The.

MACHINERY.—(Coping.)
Newton Mch. Tool Works, Inc.

MACHINERY.—(Crushing.)
Bartlett & Snow Co., C. O.
Vulcan Iron Works.

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Espen-Lucas Machine Works.
Newton Mach. Tool Works, Inc.
Taylor-Wilson Mfg. Co.

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Armstrong Mfg. Co.
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Baush Machine Tool Co.
Massillon Fdy. & Mach. Co.
National Machine Co., The.
Newton Mach. Tool Wks., Inc.
Niles-Bement-Pond Co.

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Newton Mch. Tool Works, Inc.
Pawling & Harnischfeger Co.

MACHINERY.—(Drilling, Multiple.)
Baush Machine Tool Co.
Newton Mch. Tool Wks., Inc.

MACHINERY.—(Drilling, Radial.)
Baush Machine Tool Co.
Newton Mch. Tool Wks., Inc.

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Thomson Electric Welding Co.
Toledo Electric Welder Co.

MACHINERY.—(Elevating and Conveying.)
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Brown Hoisting Machinery Co.
McMyler Interstate Co.
Mead-Morrison Mfg. Co.
Vulcan Iron Works.
Wellman-Seaver-Morgan Co.

MACHINERY.—(Forging.)
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Bliss Co., E. W.
Mesta Machine Co.
Morgan Engineering Co.
Tod Co., Wm.
United Engrg. & Fdy. Co.
Waterbury Farrell Fdy. & Mach. Co.

MACHINERY.—(Galvanizing.)
Erie Foundry Co.

MACHINERY.—(Gear Cutting.)
Bilgram Machine Works.
Cincinnati Gear Cutting Machine Co.
Cincinnati Shaper Co.
Newton Machine Tool Works, Inc.

MACHINERY.—(Grinding.)
Blake & Johnson Co.
Landis Tool Co.
Newton Mch. Tool Works, Inc.
Norton Co.

MACHINERY.—(Hydraulic.)
Mesta Machine Co.
Tod Co., Wm.
United Engrg. & Fdy. Co.
Watson-Stillman Co.

MACHINERY.—(Milling.)
Cincinnati Milling Mach. Co.
Espen-Lucas Machine Co.
Foote Bros. Gear & Mch. Co.
McCabe, J. J.
Newton Mch. Tool Wks., Inc.
Niles-Bement-Pond Co.
Warner & Swasey Co.

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McMyler Interstate Co.
Thew Automatic Shovel Co.

MACHINERY.—(Molding.)
Arcade Mfg. Co.
Taylor-Wilson Mfg. Co.

MACHINERY.—(Nut Facing.)
Newton Mch. Tool Wks., Inc.

MACHINERY.—(Pipe Mill.)
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Standard Engineering Co.
Taylor-Wilson Mfg. Co.
United Engrg. & Fdy. Co.
Williams Tool Co.

MACHINERY.—(Planing.)
Newton Mch. Tool Wks., Inc.

MACHINERY.—(Power Transmission.)
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Mesta Machine Co.
Westinghouse Elec. & Mfg. Co.

MACHINERY.—(Rolling Mill.)
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Birdsboro Steel Fdy. & Mch. Co.
Blake & Johnson Co.
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Farrell Foundry & Machine Co.
Fawcus Machine Co.
Garrison, A., Foundry Co.
Hyde Park Fdy. & Machine Co.
Johnston & Jennings Co.
Lake Erie Engineering Works.
Mackintosh, Hemphill & Co.
Mesta Machine Co.
Morgan Construction Co.
Morgan Engineering Co.
Newbold, R. S., & Son Co.
Standard Engineering Co.
Tod Co., Wm.
Union Fdy. & Mach. Co.
United Engrg. & Fdy. Co.
Wellman-Seaver-Morgan Co.
Wheeling Mold & Fdy. Co.
Youngstown Fdy. & Mach. Co.

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Cook Co., Asa S.

MACHINERY.—(Screw Shaving.)
Potter & Johnston Mach. Co.

MACHINERY.—(Second Hand.)
Baird Machinery Co.
McCabe, J. J.
Ryerson, Jos. T., & Son.
Stewart Co., Paul.
Toomey, Frank.

MACHINERY.—(Shaping.)
Potter & Johnston Mch. Co.

MACHINERY.—(Shearing.)
Bertsch & Co.
Erie Foundry Co.
Mesta Machine Co.

MACHINERY.—(Sheet Metal Working.)
Bertsch & Co.
Bliss Co., E. W.

MACHINERY.—(Shovel.)
Bertsch & Co.

MACHINERY.—(Spike and Rivet.)
Waterbury-Farrell Fdy. & Mach. Co.
Youngstown Fdy. & Mch. Co.

MACHINERY.—(Tapping.)
Baker Bros.

MACHINERY.—(Thread Rolling.)
Blake & Johnson Co.

MACHINERY.—(Tin House.)
Birdsboro Steel Fdy. & Mch. Co.
United Engineering & Fdy. Co.

MACHINERY.—(Wire.)
Blake & Johnson Co.

MACHINERY.—(Wire Drawing, Wire and Rivet Works.)
Turner, Vaughn & Taylor Co.

MACHINERY.—(Wire Galvanizing, Wire Tinning, Wire Nails.)
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MACHINERY.—(Wire Nail.)
National Machinery Co.

MACHINERY.—(Wire Nails and Staples, Wire Nail Mills.)
Kilby Mfg. Co.
Turner, Vaughn & Taylor Co.

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Blake & Johnson Co.
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Fawcus Machine Co.
Foote Bros. Gear & Mach. Co.
Kilby Mfg. Co.
Manning, Maxwell & Moore, Inc.
Merrill Bros.
Mesta Machine Co.
Morgan Engineering Co.
Tod Co., Wm.
Toledo Machine & Tool Co.

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American Refractories Co.
Stowe-Fuller Co.

MAGNETS.—(Lifting.)
Cutler-Hammer Clutch Co.
Electric Controller & Mfg. Co.

METAL.—(Antimony, Copper.)
Blackwell, Geo. G., Sons & Co.

METAL.—(Babbitt.)
U. S. Reduction Co.

METAL.—(Chemical Test Of.)
Metallurgical Testing Laboratories Co.

METAL.—(Expanded.)
Youngstown Iron & Steel Co.

METAL.—(Free From Carbon.)
Goldschmidt Thermit Co.

METAL.—(Heat Treatment Of.)
Metallurgical Testing Laboratories Co.
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METALS.—(Non-Ferrous.)
Titanium Alloy Mfg. Co.
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METAL.—(Perforated.)
Cross Engineering Co.
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METAL.—(Physical Test Of.)
Metallurgical Testing Laboratories Co.

METAL.—(Washed.)
Brier Hill Steel Co., The.

MILLS.—(Billet.)
Morgan Construction Co.

MILLS.—(Blooming, Universal, Plate, Sheet, Tin, Bar.)
Mesta Machine Co.

MILLS.—(Continuous Rolling.)
Morgan Construction Co.

MILLS.—(Wire Complete Equipment.)
Blake & Johnson Co.
Morgan Construction Co.
Turner, Vaughn & Taylor Co.

MODELS.—(Made to Order.)
Standard Pattern Works Co.

MOLDS.—(Ingot.)
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Interstate Foundry Co.
Marshall Foundry Co.
Youngstown Fdy. & Machine Co.

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Detroit Hoist & Machine Co.
Westinghouse Elec. & Mfg. Co.

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Crocker-Wheeler Co.
General Electric Co.
Westinghouse Electric & Mfg. Co.

MOTORS.—(Mill.)
General Electric Co.
Westinghouse Elec. & Mfg. Co.

NAILS.
American Steel & Wire Co.
Cambria Steel Co.
Jones & Laughlin Steel Co.
La Belle Iron Works.
Newport Rolling Mill Co.
Youngstown Sheet & Tube Co.

NIPPLES.
National Tube Co.

NUTS.
American Bridge Co. of N. Y.
American Iron & Steel Co.
Atlas Bolt & Screw Co.
Bourne-Fuller Co.
Cleveland City Forge & Iron Co.
Garland Nut & Rivet Co.
Gary Screw & Bolt Co.
Lockhart Iron & Steel Co.
Milton Iron & Steel Co.
Oliver Iron & Steel Co.
Pittsburgh Screw & Bolt Co.
Republic Iron & Steel Co.
Russell, Burdsall & Ward Bolt & Nut Co.
Scully Steel & Iron Co.
Steel Car Forge Co.
Upson Nut Co.

NUTS.—(Hot Pressed.)
American Iron & Steel Mfg. Co.
Bourne-Fuller Co.
Milton Mfg. Co.
Republic Iron & Steel Co.
Upson Nut Co.

OILERS.—(Engine, Machine.)
Gem Manufacturing Co.

ORE.—(Chrome.)
Blackwell, Geo. G., Sons & Co., Ltd.
Samuel, Frank.

ORE.—(Iron.)
Blackwell, Geo. G., Sons & Co., Ltd.
Breitung, E. N., & Co.
Hanna, M. A., & Co.
Hillman & Son, J. H.
La Belle Iron Works.
Oglebay, Norton & Co.
Pickands, Brown & Co.
Pickands, Mather & Co.
Snyder & Co., W. P.
Tod-Stambaugh Co.

OVENS.—(By-Product Coke Ovens.)
Coal Distillation Co.
Gas Machinery Co., The.
United Coke & Gas Co.

OVENS.—(Coke.)
Coal Distillation Co.
Gas Machinery Co., The.
United Coke & Gas Co.

OVENS.—(Core.)
Quigley Furnace & Foundry Co.
Whiting Fdy. Equipment Co.

PANS.—(Grinding.)
Phillips & McLaren Co.

PANS.—(Lathe.)
New Britain Machine Co.

PANS.—(Shop.)
American Bridge Co. of N. Y.

PATTERNS.
Arcade Mfg. Co.
Buffalo Fdy. & Mch. Co.
Canton Brass & Mch. Co.
Standard Pattern Wks. Co., The.
Standard Steel Castings Co., The.

PERFORATING.—(Sheet Metal, Automatic, Screen Work.)
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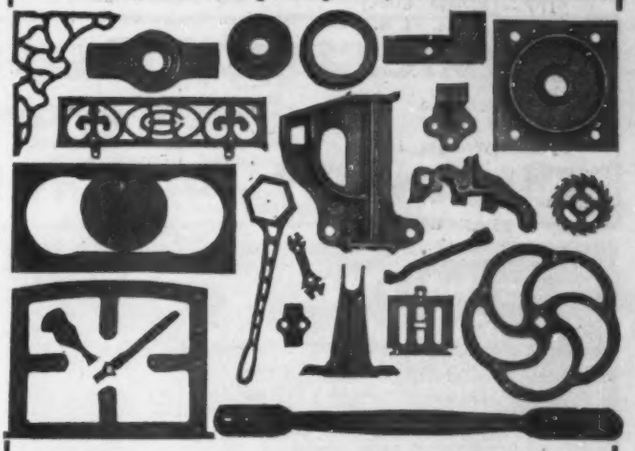

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PINS.—(Pivot.)
Champion Rivet Co.

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National Tube Co.
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Struthers-Wells Co.
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Republic Iron & Steel Co.
Youngstown Sheet & Tube Co.

PIPE.—(Iron and Steel, Galvanized.)
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Youngstown Sheet & Tube Co.

PIPE.—(Line, Iron and Steel.)
Youngstown Sheet & Tube Co.

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Cambria Steel Co.
Graver Tank Works, Wm.
National Boiler & Sheet Iron Works.
Riter-Conley Mfg. Co.
Struthers-Wells Co.

PIPE.—(Wrought Iron.)
Bourne-Fuller Co.
Pittsburgh Piping & Equip. Co.
Youngstown Sheet & Tube Co.

PLANERS.
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Cincinnati Shaper Co.
Cleveland Punch & Shear Works Co.
Manning, Maxwell & Moore, Inc.
Ryerson, Jos. T., & Son.

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Smith Gas Power Co., The.

PLANTS.—(Powdered Coal.)
Quigley Furnace & Foundry Co.

PLATE.—(Tin.)
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American Sheet & Tin Plate Co.
Carnahan Tin Plate & Sheet Co.
Jones & Laughlin Steel Co.
Phillips Sheet & Tin Plate Co.
Standard Tin Plate Co.
Taylor, N. & G., Co.
Trumbull Steel Co.

PLATES.
Allegheny Steel Co.
Bourne-Fuller Co.
Cambria Steel Co.
Carnahan Tin Plate & Sheet Co.
Illinois Steel Co.
Illinois Steel Co., Warehouse Dept.
Illinois Steel Warehouse Co.
Inland Steel Co.
Jones & Laughlin Steel Co.
La Belle Iron Works.
Lackawanna Steel Co.
Newport Rolling Mill Co.
Otis Steel Co.
Portsmouth Steel Co.
Republic Iron & Steel Co.
Ryerson, Jos. T., & Son.
Taylor, N. & G., Co.
Tenn. Coal, Iron & R. R. Co.
Trumbull Steel Co.
Wood, Alan, Iron & Steel Co.
Worth Bros. Co.
Youngstown Sheet & Tube Co.

PLATES.—(Boiler and Tank.)
American Rolling Mill Co.
Andrews Steel Co.
Bourne-Fuller Co.
La Belle Iron Works.
Newport Rolling Mill Co.
Otis Steel Co.
Portsmouth Steel Co.
Ryerson & Son, Jos. T.

PLATES.—(Felloe.)
Wrought Washer Mfg. Co.

PLATES.—(Floor, Rolled Steel.)
Carnegie Steel Co.
National Tube Co.
Wood, Alan, Iron & Steel Co.

PLATES.—(Sheared.)
Bourne-Fuller Co.
Cambria Steel Co.
Carnegie Steel Co.
Cincinnati Iron & Steel Co.
Illinois Steel Co.
Newport Rolling Mill Co.
Portsmouth Steel Co.

PLATES.—(Terne.)
Carnahan Tin Plate & Sheet Co.
Trumbull Steel Co.

PLATES.—(Tie.)
Illinois Steel Co.
Lackawanna Steel Co.

PLATES.—(Universal.)
Bourne-Fuller Co.
Carnegie Steel Co.
Illinois Steel Co.
La Belle Iron Works.
Youngstown Sheet & Tube Co.

PLUMBAGO.
Dixon, Jos., Crucible Co.

POINTERS.—(Wire Rod, Wire Mills.)
Turner, Vaughn & Taylor Co.

POLES.—(Gin.)
American Bridge Co. of N. Y.

POTS.—(Galvanizing.)
American Bridge Co. of N. Y.

PRESSES.
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Bliss, E. W., Co.
Chambersburg Engrg. Co.
Cleveland Punch & Shear Works Co.
Lake Erie Engineering Works.
Mackintosh, Hemphill & Co.
Mesta Machine Co.
Morgan Engineering Co.
Niles-Bement-Pond Co.
Ryerson, Jos. T., & Son.
Tod Co., Wm.
United Engrg. & Fdy. Co.
Waterbury-Farrel Fdy. & Mach. Co.
Wood, R. D., Co.

PRESSES.—(Bending and Flanging.)
Mesta Machine Co.

PRESSES.—(Drill, Heavy Duty.)
Colburn Machine Tool Co.

PRESSES.—(Drill, Multiple Spindle.)
Colburn Machine Tool Co.

PRESSES.—(Forging.)
Mesta Machine Co.
Morgan Engineering Co.
Tod Co., Wm.
United Engrg. & Fdy. Co.

PRESSES.—(Hydraulic.)
Mesta Machine Co.
Tod Co., Wm.
United Engrg. & Fdy. Co.
Watson-Stillman Co.

PRESSES.—(Power.)
Toledo Machine & Tool Co.

PRESSES.—(Rail Straightening.)
Tod Co., Wm.

PRESSES.—(Steam, Sleeves, Runner Brick, Nozzles and Tuyeres, Fire Brick Wks.)
Turner, Vaughn & Taylor Co.

PRESSES.—(Toggle Drawing.)
Toledo Machine & Tool Co.

PRESSES.—(Trimming.)
Erie Foundry Co.
Massillon Fdy. & Mach. Co.
Toledo Machine & Tool Co.

PRODUCERS.—(Gas.)
Chapman Engineering Co.
Eynon-Evans Mfg. Co.
Gas Machinery Co.
Hagan Co., Geo. J.
Morgan Construction Co.
Smith Gas Power Co., The
Struthers-Wells Co.
Wellman-Seaver-Morgan Co.

PULLEYS.
Jones & Laughlin Steel Co.

PUMPS.
Aldrich Pump Dept.
Cameron, A. S., Steam Pump Works.
Dean Bros. Steam Pump Wks.
Deming Co.
Hooven, Owens & Rentschler Co.
Lake Erie Engrg. Works.
Tod Co., Wm.

PUMPS.—(Bank.)
Dean Bros. Steam Pump Works

PUMPS.—(Boiler Feed.)
Aldrich Pump Department.
Cameron, A. S., Steam Pump Wks.
Dean Bros. Steam Pump Works.
Deming Co.
Vulcan Iron Works.

PUMPS.—(Compound.)
Cameron, A. S., Steam Pump Wks.
Dean Bros. Steam Pump Works.

PUMPS.—(Deep Well.)
Cameron, A. S., Steam Pump Wks.
Dean Bros. Steam Pump Works.
Deming Co.

PUMPS.—(Electric Driven.)
Aldrich Pump Department.
Dean Bros. Steam Pump Works.
Deming Co.

PUMPS.—(Elevator.)
Aldrich Pump Department.
Dean Bros. Steam Pump Works.

PUMPS.—(Hydraulic.)
Aldrich Pump Department.
Cameron, A. S., Steam Pump Wks.
Dean Bros. Steam Pump Works.
Deming Co.

PUMPS.—(Mine.)
Aldrich Pump Department.
Cameron, A. S., Steam Pump Wks.
Dean Bros. Steam Pump Works.
Deming Co.

PUMPS.—(Steam.)
Cameron, A. S., Steam Pump Wks.
Dean Bros. Steam Pump Works.

PUMPS.—(Vacuum.)
Buffalo Fdy. & Mach. Co.
Bury Compressor Co.
Cameron, A. S., Steam Pump Wks.
Dean Bros. Steam Pump Works.
Deming Co.
Mesta Machine Co.

PUNCHES AND SHEARS.
Allen, John F., Co.
Alliance Machine Co.
Bertsch & Co.
Birdsboro Steel Foundry & Machine Co.
Bliss, E. W., Co.
Canton Foundry & Machine Co.
Cleveland Punch & Shear Wks. Co.
Covington Machine Co.
Mackintosh, Hemphill & Co.
Massillon Fdy. & Machine Co.
Morgan Engineering Co.
Niles-Bement-Pond Co.
Ryerson, Jos. T., & Son.
Scully Steel & Iron Co.
Standard Bridge Tool Co.
Tod Co., Wm.
United Engrg. & Fdy. Co.
Watson-Stillman Co.
Wood, R. D., & Co.

PUNCHES.—(Hand.)
Bertsch & Co.
Bourne-Fuller Co.

PUNCHES.—(Hydraulic.)
Bertsch & Co.
Mesta Machine Co.
Tod Co., Wm.
Watson-Stillman Co.

PUNCHES.—(Multiple.)
Bertsch & Co.
Bliss Co., E. W.
Mackintosh, Hemphill & Co.

PUNCHES.—(Pneumatic.)
Allen, John F., Co.

PYROMETERS.
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Illinois Steel Co., Warehouse Dept.
Illinois Steel Warehouse Co.
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REAMERS.
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Champion Rivet Co.
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Illinois Steel Warehouse Co.
Inland Steel Co.
Jones & Laughlin Steel Co.
Lockhart Iron & Steel Co.
Oliver Iron & Steel Co.
Pittsburgh Screw & Bolt Co.
Progressive Mfg. Co.
Republic Iron & Steel Co.
Russell, Burdsall & Ward Bolt & Nut Co.
Ryerson, Jos. T., & Son.
Scully Steel & Iron Co.
Steel Car Forge Co.
Upson Nut Co.

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Bourne-Fuller Co.
Pittsburgh Shafting Co. of Detroit.

RODS.—(Iron and Steel.)
American Iron & Steel Mfg. Co.
Jones & Laughlin Steel Co.
Upson Nut Co.
Youngstown Sheet & Tube Co.

RODS.—(Straightened and Cut.)
Youngstown Sheet & Tube Co.

RODS.—(Wire.)
American Steel & Wire Co.
Ashland Steel Co.

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Morgan Engineering Co.
United Engrg. & Fdy. Co.

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Republic Iron & Steel Co.
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National Separator & Mch. Co.

SEPARATORS.—(Magnetic.)
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Pittsburgh Shaft'g Co. of Detroit.
Republic Iron & Steel Co.
Scully Steel & Iron Co.
Standard Gauge Steel Co.
Union Drawn Steel Co.

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Columbia Steel & Shafting Co.
Republic Iron & Steel Co.

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Inland Steel Co.
Jones & Laughlin Steel Co.
Laclede Steel Co.
Republic Iron & Steel Co.

SHAPES.—(Steel, Structural and Special Rolled.)
Bourne-Fuller Co.
Cambria Steel Co.
Illinois Steel Co.
Pittsburgh Shaft'g Co. of Detroit.
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SHEARS.—(Angle and Plate.)
Bertsch & Co.
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United Engrg. & Fdy. Co.

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SHEARS.—(Flying and Bar.)
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Morgan Construction Co.

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Mesta Machine Co.
United Engrg. & Fdy. Co.
Youngstown Fdy. & Mch. Co.

SHEARS—(Portable, Motor Driven.)
Canton Foundry & Machine Co.

SHEARS.—(Power.)
Canton Foundry & Machine Co.
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SHEARS.—(Scrap, Alligator, Wire and Wire Nail Mills.)
Canton Foundry & Machine Co.
Covington Machine Co.
Turner, Vaughn & Taylor Co.
Youngstown Fdy. & Mch. Co.

SHEARS.—(Squaring.)
Bertsch & Co.
Bliss Co., E. W.
Erie Foundry Co.
Garrison, A., Foundry Co.
Mesta Machine Co.
Tod Co., Wm.
United Engrg. & Fdy. Co.

SHEARS.—(Vertical.)
Bertsch & Co.
Mesta Machine Co.
Tod Co., Wm.
United Engrg. & Fdy. Co.

SHEETS.—(Black Steel.)
American Rolling Mill Co.
American Sheet & Tin Plate Co.
Bourne-Fuller Co.
Brier Hill Steel Co.
Canton Sheet Steel Co.
Cincinnati Iron & Steel Co.
Inland Steel Co.
Newport Rolling Mill Co.
Portsmouth Steel Co.
Ryerson, Joseph T., & Son.
Seneca Iron & Steel Co.
Stark Rolling Mill Co.
Youngstown Iron & Steel Co.
Youngstown Sheet & Tube Co.

SHEETS.—(Blue Annealed.)
American Rolling Mill Co.
American Sheet & Tin Plate Co.
Andrews Steel Co.
Bourne-Fuller Co.
Brier Hill Steel Co., The
Cincinnati Iron & Steel Co.
Inland Steel Co.
Newport Rolling Mill Co.
Portsmouth Steel Co.
Seneca Iron & Steel Co.
Stark Rolling Mill Co.
Youngstown Sheet & Tube Co.

SHEETS.—(Corrugated.)
American Rolling Mill Co.
American Sheet & Tin Plate Co.
Bourne-Fuller Co.
Brier Hill Steel Co.
Cincinnati Iron & Steel Co.
Inland Steel Co.
La Belle Iron Works.
Massillon Rolling Mill Co.
Newport Rolling Mill Co.
Portsmouth Steel Co.
Ryerson & Son, Jos. T.
Seneca Iron & Steel Co.
Stark Rolling Mill Co.
Trumbull Steel Co.
Youngstown Iron & Steel Co.
Youngstown Sheet & Tube Co.

SHEETS.—(Dead Soft for Stamping.)
American Rolling Mill Co.
American Sheet & Tin Plate Co.
Bourne-Fuller Co.
Brier Hill Steel Co., The
Canton Sheet Steel Co.
Inland Steel Co.
Portsmouth Steel Co.
Seneca Iron & Steel Co.
Stark Rolling Mill Co.
Youngstown Iron & Steel Co.
Youngstown Sheet & Tube Co.

SHEETS.—(Deep Drawing Stock.)
American Rolling Mill Co.
American Sheet & Tin Plate Co.
Bourne-Fuller Co.
Inland Steel Co.
Massillon Rolling Mill Co.
Youngstown Iron & Steel Co.

SHEETS.—(Galvanized.)
Allegheny Steel Co.
American Rolling Mill Co.
American Sheet & Tin Plate Co.
Bourne-Fuller Co.
Brier Hill Steel Co.
Canton Sheet Steel Co.
Inland Steel Co.
La Belle Iron Works.
Massillon Rolling Mill Co.
Newport Rolling Mill Co.
Parkersburg Iron & Steel Co.
Portsmouth Steel Co.
Republic Iron & Steel Co.
Ryerson & Son, Jos. T.
Seneca Iron & Steel Co.
Stark Rolling Mill Co.
Trumbull Steel Co.
Wood, Alan, Iron & Steel Co.
Youngstown Iron & Steel Co.
Youngstown Sheet & Tube Co.

SHEETS.—(Iron and Steel.)
Allegheny Steel Co.
American Rolling Mill Co.
American Sheet & Tin Plate Co.
Bourne-Fuller Co.
Brier Hill Steel Co.
Canton Sheet Steel Co.
Disston & Sons, Inc., Henry
Illinois Steel Co.
Illinois Steel Co., Warehouse Dept.
Illinois Steel Warehouse Co.
Inland Steel Co.
La Belle Iron Works.
Massillon Rolling Mill Co.
Newport Rolling Mill Co.
Phillips Sheet & Tin Plate Co.
Portsmouth Steel Co.
Republic Iron & Steel Co.
Ryerson, Jos. T., & Son.
Scully Steel & Iron Co.
Seneca Iron & Steel Co.
Stark Rolling Mill Co.
Tenn. Coal, Iron & R. R. Co.
Trumbull Steel Co.
Wood, Alan, Iron & Steel Co.
Worth Bros. Co.
Youngstown Sheet & Tube Co.

SHEETS.—(Open-Hearth.)
American Sheet & Tin Plate Co
Bourne-Fuller Co.
Brier Hill Steel Co., The
Canton Sheet Steel Co.
Inland Steel Co.
Newport Rolling Mill Co.
Portsmouth Steel Co.
Seneca Iron & Steel Co.
Stark Rolling Mill Co.
Trumbull Steel Co.
Youngstown Iron & Steel Co.

SHEETS.—(Pickled and Cold Rolled.)
American Rolling Mill Co.
American Sheet & Tin Plate Co.
Bourne-Fuller Co.
Canton Sheet Steel Co.
Inland Steel Co.
Trumbull Steel Co.
Youngstown Sheet & Tube Co.

SHEETS.—(Polished.)
American Rolling Mill Co.
American Sheet & Tin Plate Co.
Bourne-Fuller Co.
Canton Sheet Steel Co.
Carnahan Tin Plate & Sheet Co.
Newport Rolling Mill Co.

SHEETS.—(Steel Box Annealed.)
American Sheet & Tin Plate Co.
Brier Hill Steel Co., The
Canton Sheet Steel Co.
Portsmouth Steel Co.
Trumbull Steel Co.
Youngstown Iron & Steel Co.
Youngstown Sheet & Tube Co.

SHELVING.—(Steel.)
New Britain Mach. Co.

SHINGLES.—(Metal.)
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Trumbull Steel Co.

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Drouve Co., G.

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Cambria Steel Co.
La Belle Iron Works
Portsmouth Steel Co.
Youngstown Sheet & Tube Co.

SLABS.—(Sheet.)
Inland Steel Co.
La Belle Iron Works
Lackawanna Steel Co.
Tenn. Coal, Iron & R. R. Co.
Youngstown Sheet & Tube Co.

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Republic Iron & Steel Co.

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American Bridge Co. of N. Y.
Andrews Steel Co.
Bourne-Fuller Co.
Cambria Steel Co.
Carnegie Steel Co.
Disston & Sons, Inc., Henry
Franklin Steel Works.
Illinois Steel Co.
Illinois Steel Co., Warehouse Dept.
Illinois Steel Warehouse Co.
Inland Steel Co.
Jones & Laughlin Steel Co.
La Belle Iron Works.
Laclede Steel Co.
Lockhart Iron & Steel Co.
Milne, A., & Co.
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Pittsburgh Shafting Co. of Detroit.
Portsmouth Steel Co.
Republic Iron & Steel Co.
Ryerson, Jos. T., & Son.
Tenn. Coal, Iron & R. R. Co.
Upson Nut Co.
Wood, Alan, Iron & Steel Co.
Youngstown Sheet & Tube Co.

STEEL.—(Alloy.)
United Steel Co.

STEEL.—(Automobile.)
United Steel Co.

STEEL.—(Axle, Automobile, Mining Car.)
Columbia Steel & Shafting Co.
Roechling Electro Steel Co.
Union Drawn Steel Co.

STEEL.—(Cold Rolled.)
Bourne-Fuller Co.
Columbia Steel & Shafting Co.
Newport Rolling Mill Co.
Pittsburgh Shaft'g Co. of Detroit.
Scully Steel & Iron Co.

STEEL.—(Cold Drawn.)
Bourne-Fuller Co.
Columbia Steel & Shafting Co.
Pittsburgh Shaft'g Co. of Detroit.
Standard Gauge Steel Co.
Union Drawn Steel Co.

STEEL.—(Electric.)
Illinois Steel Co.
Newport Rolling Mill Co.

STEEL.—(Forging.)
United Steel Co.

STEEL.—(Gear.)
United Steel Co.

STEEL.—(High Speed.)
Bethlehem Steel Co.
Bourne-Fuller Co.
Firth-Sterling Steel Co.
Vanadium Alloys Steel Co.

STEEL.—(Open-Hearth.)
Bourne-Fuller Co.
Brier Hill Steel Co, The
Cambria Steel Co.
Illinois Steel Co.
Inland Steel Co.
Portsmouth Steel Co.
United Steel Co.
Union Drawn Steel Co.
Upson Nut Co.

STEEL.—(Rock Drill.)
Milne, A., & Co.

STEEL.—(Screw Stock.)
Columbia Steel & Shafting Co.

STEEL.—(Spring.)
United Steel Co.

STEEL.—(Structural.)
American Bridge Co. of N. Y.
Bethlehem Steel Co.
Blaw Steel Construction Co.
Bourne-Fuller Co.
Cambria Steel Co.
Carnegie Steel Co.
Champion Iron Co.
Cincinnati Iron & Steel Co.
Illinois Steel Co.
Illinois Steel Co., Warehouse Dept.
Illinois Steel Warehouse Co.
Independent Bridge Co.
Inland Steel Co.
Jones & Laughlin Steel Co.
Lackawanna Steel Co.
McClintic-Marshall Co.
Portsmouth Steel Co.
Republic Iron & Steel Co.
Riter-Conley Mfg. Co.
Ryerson, Joseph T., & Son.
Youngstown Car & Mfg. Co.

STEEL.—(Tool.)
Bethlehem Steel Co.
Bourne-Fuller Co.
Cincinnati Iron & Steel Co.
Electro Steel Co.
Firth-Sterling Steel Co.
Milne, A., & Co.
Ryerson, Joseph T. & Son.
Vanadium Alloys Steel Co.

STEEL.—(Twisted.)
Bourne-Fuller Co.
Cincinnati Iron & Steel Co.
Franklin Steel Works.
Upson Nut Co.

STEEL.—(Vanadium.)
Andrews Steel Co.
Bourne-Fuller Co.
Carnegie Steel Co.
Vanadium Alloys Steel Co.

STILLS.—(Benzole.)
Gas Machinery Co., The

STOCKS.
Mark Mfg. Co.

STOKERS.
Erie Foundry Co.
Green Engineering Co.
Rosedale Foy. & Mach. Co.

STONES.—(Oil.)
Norton Co.

STONES.—(Rubbing and Sharpening.)
Norton Co.

STOOLS.—(Steel.)
Angle Steel Stool Co.

STUDDING.—(Metal.)
Youngstown Iron & Steel Co.

SUPPLIES.—(Well.)
Mark Mfg. Co.

SWITCHES.—(Cut-Out Lamp Hanger.)
Thompson Electric Co., The

SWITCHES.—(Electrical.)
Cutler-Hammer Mfg. Co.
Electric Controller & Mfg. Co.
Westinghouse Electric & Mfg. Co.

SWITCHES.—(Magnetic.)
Cutler-Hammer Mfg. Co.
Electric Controller & Mfg. Co.
Westinghouse Electric & Mfg. Co.

SWITCHES.—(Solenoid.)
Cutler-Hammer Mfg. Co.

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TABLES.—(Rolling Mill.)
Mackintosh, Hemphill & Co.
Morgan Construction Co.
Tod Co., Wm.
United Engrg. & Fdy. Co.

TANKS AND TOWERS.
American Annealing Box Co.
American Bridge Co. of N. Y.
Graver Tank Works, Wm.
Kenwood Bridge Co.
National Boiler & Sheet Iron Wks.
National Tube Co.
Riter-Conley Mfg. Co.
Struthers-Wells Co.
Western Drop Forge Co.

TANKS.—(Water and Acid Storage, Wire Mills.)
Struthers-Wells Co.
Turner, Vaughn & Taylor Co.

TEETH.—(Steel Harrow.)
Inland Steel Co.

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Goldschmidt Thermit Co.

THERMOMETERS.
Bristol Co.
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TIES.—(Creosoted.)
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Ohio Wood Preserving Co.
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Union Mining Co.

TINNING.—(Custom.)
Cleveland Galvanizing Works Co.

TITANIUM.
Titanium Alloy Mfg. Co.

TOOLS.—(Machinists.)
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Cleveland Pneumatic Tool Co.
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Brown Hoisting Machinery Co.
Northern Engrg. Works.
Whiting Foundry Equipment Co.

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National Tube Co.

TROLLEYS.
Brown Hoisting Machinery Co.
Browning Engineering Co.
Chisholm & Moore Mfg. Co.
Whiting Foundry Equipment Co.

TRUCKS.—(Foundry.)
Sterling Wheelbarrow Co.

TRUCKS.—(Motor.)
Kissel Motor Car Co.

TRUCKS.—(Wire, Rod, Wire Mills.)
Turner, Vaughn & Taylor Co.

TUBES.
Andrews Steel Co.
Mark Mfg. Co.
National Tube Co.
Republic Iron & Steel Co.
Youngstown Sheet & Tube Co.

TUBES.—(Boiler.)
Allegheny Steel Co.
Andrews Steel Co.
Bourne-Fuller Co.
National Tube Co.
Newport Rolling Mill Co.
Ryerson, Joseph T., & Son
Scully Steel & Iron Co.
Worth Bros. Co.

TUBING.—(Automobile.)
National Tube Co.

TUBING.—(Oil Well.)
National Tube Co.
Pittsburgh Shaft'g Co. of Detroit.
Youngstown Sheet & Tube Co.

TUBING.—(Seamless Steel.)
National Tube Co.
Pittsburgh Shafting Co. of Detroit

TUMBLING MILLS.
Northern Engineering Works.
Sly Mfg. Co., W. W.
Whiting Fdy. Equipment Co.

TURBINES.—(Steam.)
General Electric Co.
Westinghouse Elec. & Mfg. Co.

TURNBUCKLES.
American Bridge Co. of N. Y.
American Iron & Steel Mfg. Co.
Bourne-Fuller Co.
Cleveland City Forge & Iron Co.
Michigan Bolt & Nut Works.
Milton Mfg. Co.
Republic Iron & Steel Co.
Russell, Burdsall & Ward Bolt & Nut Co.

TURNTABLES.
American Bridge Co. of N. Y.
Atlas Car & Mfg. Co.
Canton Fdy. & Mach. Co.
Chase Foundry & Mfg. Co.

UNIONS.—(Pipe.)
Dart, E. M., Mfg. Co.
Illinois Malleable Iron Co.
Mark Mfg. Co.
National Tube Co.

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Gas Machinery Co., The
Locke Regulator Co.
Mackintosh, Hemphill & Co.
National Tube Co.
Pittsburgh Piping & Equip. Co.
Pittsburgh Valve, Foundry & Construction Co.
Scully Steel & Iron Co.
Shaw-Kendall Engineering Co.

VALVES AND FITTINGS.—(Hydraulic.)
Mackintosh, Hemphill & Co.
National Tube Co.

VANADIUM.
Goldschmidt Thermit Co.

VISES.
Mark Mfg. Co.
Merrill Bros.
Potter & Johnston Mach. Co.

WAGON HARDWARE.
Oliver Iron & Steel Co.

WASHERS.
American Iron & Steel Mfg. Co.
Bettcher Mfg. Co.
Bourne-Fuller Co., The.
Milton Mfg. Co.
Newport Rolling Mill Co.
Oliver Iron & Steel Co.
Russell, Burdsall & Ward Bolt & Nut Co.
Upson Nut Co.
W. & S. Mfg. Co.
Wrought Washer Mfg. Co.

WATER SOFTENERS AND PURIFIERS.
Graver Tank Works, Wm. E.

WELDERS.—(Electric.)
Thomson Elec. Welding Co.
Toledo Electric Welder Co.

WELDING.—(Custom.)
International Oxygen Co.
Oxweld Acetylene Co.
Thomson Electric Welding Co.
Western Drop Forge Co.

WELDING.—(Oxy-Acetylene Process.)
International Oxygen Co.
Oxweld Acetylene Co.

WELDING.—(Thermit.)
Goldschmidt Thermit Co.

WHEELBARROWS.
Sterling Wheelbarrow Co.

WHEELS.—(Alundum.)
Norton Co.

WHEELS.—(Grinding.)
Norton Co.

WHEELS.—(Rope.)
Mesta Machine Co.

WHEELS.—(Steel Car.)
American Steel Foundries.
Carnegie Steel Co.
Lobdell Car Wheel Co.

WIRE.
American Steel & Wire Co.
Cambria Steel Co.
Jones & Laughlin Steel Co.
Seneca Wire & Mfg. Co.
Youngstown Sheet & Tube Co.

WIRE.—(Barbed.)
American Steel & Wire Co.
Youngstown Sheet & Tube Co.

WIRE.—(Cable and Rope.)
American Steel & Wire Co.

WIRE.—(Grilles.)
American Steel & Wire Co.

WIRE.—(Threaded.)
Atlas Bolt & Screw Co.
Progressive Mfg. Co.

WIRE MILLS.—(Complete Equipment.)
Turner, Vaughn & Taylor Co.

WRENCHES.
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All kinds of Alloy Steel carried in stock
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SPECIAL DROP FORGINGS OF ALL KINDS TO ORDER
SEND US PRINTS OR MODELS FOR PRICES
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Quality Guaranteed Prompt Shipment
No order too large—None too small for our careful attention.
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Let Our Factory Act as Your Press Department
We produce all kinds of drawn shells, flat work and heavy formed pieces. Our steel and brass warehouse can act as your source of supply. When we say "first class" we guarantee a high grade of material, uniformity of size and finish, accuracy to specifications, careful inspection of finished product, and prompt, regular deliveries. We have recently doubled our floor space, purchasing new presses with greater power, and can take on several new contracts.
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WOOD AND METAL PATTERNS
OF EVERY DESCRIPTION
Nothing Too Big or Too Small for Us
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PRIME WESTERN SPELTER
Used exclusively on all Angles, Bars, Bands, Beams, Channels, Hoops, Plates, Tees, Spikes, etc.
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NEW YORK CHICAGO PITTSBURGH
LEBANON, PA. PROVIDENCE, R. I.
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We invite your inquiries

Custom Galvanizing and Tinning
Hot dip process exclusively. Largest jobbing shop west of New York. Daily capacity 50 tons. We are equipped to handle large heavy castings, long angles, etc., down to small light rivets and stampings. Send sample or blue print for estimates. Also Hot Metallic Tinning.
THE CLEVELAND GALVANIZING WORKS CO.
CLEVELAND Established 1886 OHIO

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"ADVANCE" ANTIFRICTION BABBITT, 10c. POUND
A Babbitt designed to stand the wear and tear of general service.
Send a trial order for any quantity on condition if satisfactory pay for it; if not return—no expense to you.
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Presses, Pumps, Accumulators, Intensifiers, Punches, Shears, Bulldozers, Shaft straighteners, Bolt forcers, Benders, Jacks, Valves, Fittings, etc. Write for catalogs
We build to order to meet special requirements
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"FORGING SPECIALISTS"
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THE CHAMPION MACHINE & FORGING CO., Cleveland, O., "Sixth City"

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Axles for Passenger or Freight Cars and Locomotives
"Pollak" Special Heat Treated Steel
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from 10 lbs. to 100,000 lbs. each
of every shape and description
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Sheet Plate and Structural Iron Work, Oxy-Acetylene Welding
Send us blue prints and let us figure on your requirements
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We can save you money—give you accurate high grade forgings promptly and in quantities. Send samples or blue prints for quotations.
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weighing from
5 lbs. to 500 lbs.
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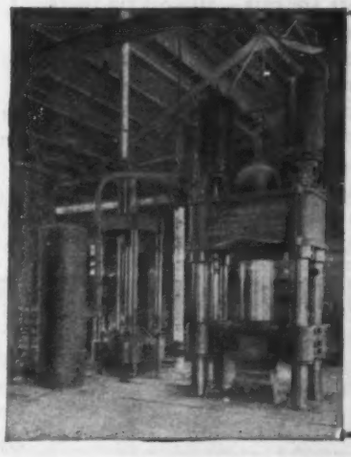
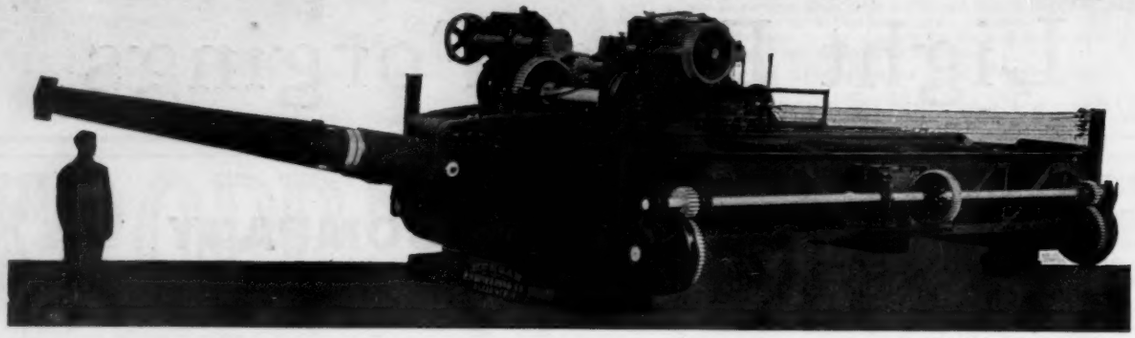


High Speed Steam Hydraulic Forging Press
See advertisement on Page 33, Dec. 4th issue of "The Iron Trade Review."
United Engineering & Foundry Co.
PITTSBURG, PENNA.

Reducing the Charging Charge



Morgan Low Type Charging Machine embodies the highest efficiency, hence the reduction of cost to a minimum.

Morgan quality steel mill equipment of all kinds---3,600 cranes in successful operation.

ASK ABOUT OUR SPECIAL BRONZE-BEARINGS AND BUSHINGS OF ALL KINDS —ACID RESISTING--AND SPECIAL BRONZE CHAIN FOR PICKLING PURPOSES.

A few users where heavy and continuous work is required:

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The MORGAN ENGINEERING COMPANY
ESTABLISHED 1868
Alliance, Ohio. U.S.A.

CHICAGO, ILL. Railway Exchange
NEW YORK 165 Broadway
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HIGH SPEED CHAIN HOISTS

The Hoist that saves **time** and **labor.** Of the most scientific and durable construction.

All bearings have **Graphite Bronze Bushings** and are therefore self lubricating. All gears are **cut**—all working parts **machined to gauge.**

We guarantee you a true and easy running mechanism that has enormous lifting capacity.

"Cyclone" High Speed Hoists range in capacity from **one-half to 40 tons.**

Let us send you our catalog giving complete information regarding **Chain Hoists, Trolleys and Hand Power Cranes.**

Write us today

THE CHISHOLM & MOORE MFG. CO.
30 Church Street, New York City Cleveland, Ohio

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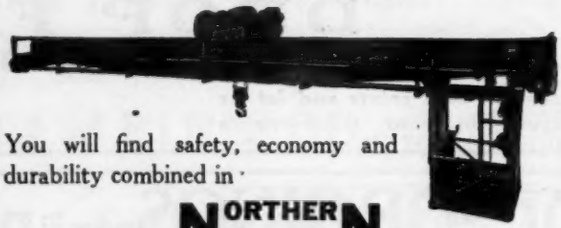

You will find safety, economy and durability combined in

NORTHERN CRANES

Electric Hoists Air Hoists Overhead Tracks

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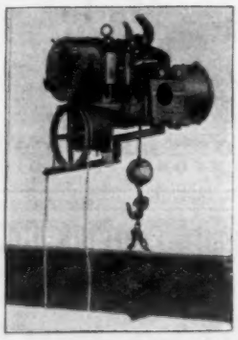

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Electric and Hand Power Traveling Cranes, Jib and Post Cranes, Electric Hoists, floor and cab operated. Overhead Trolley Systems and Trolleys.

The Euclid Crane & Hoist Co.
EUCLID, OHIO

CUTLER-HAMMER

Crane Protecting Panels

Centralize the Control and Reduce Maintenance Expense

The grouping of all switches, protective devices, etc., in one location centralizes the control and in case of sudden accident permits instant stopping of every motor on the crane.

No fuses are used on Cutler-Hammer crane protecting panels and the expense and delay of renewing them is therefore eliminated. Yet every necessary protection against overload, short circuit and failure of voltage is provided for.

The Panel illustrated is designed for a three-motor crane

Safety Switches Prevent Accidents

Any number may be located where convenient. Locking one of these in the safe position insures anyone working on the crane or repairing it against accident due to the starting of the crane by another person.

Two single pole magnetic switches are used in the main line instead of a double-pole switch—BECAUSE

Should trouble cause a double-pole switch to stick, neither side of the line would be opened. But with two single-pole switches, as used on Cutler-Hammer panels, either one will open the circuit.

Also, if an overload remains on the line, one switch will trip and open the circuit as soon as the other closes. A double-pole switch will chatter or "telegraph."

Standardizing your entire crane equipment means better efficiency. Use Cutler-Hammer enclosed drum type controllers, Cutler-Hammer Crane Protecting Panels and Cutler-Hammer Palmer Limit Safety Stops.

Booklet containing bulletins describing crane control and protecting apparatus sent on request. Write for a copy.

Insure Against Accidents On All Your Cranes

by installing the enclosed quick-break

PALMER SAFETY LIMIT STOP

This Stop not only opens the motor circuit, but provides a strong dynamic braking action, preventing over travel.

This accurate stopping is independent of stretching or other changes in hoist rope length. It acts the instant the hoist block reaches the predetermined height.

Bulletin 5010 contains complete information.

THE CUTLER-HAMMER MFG. CO. MILWAUKEE

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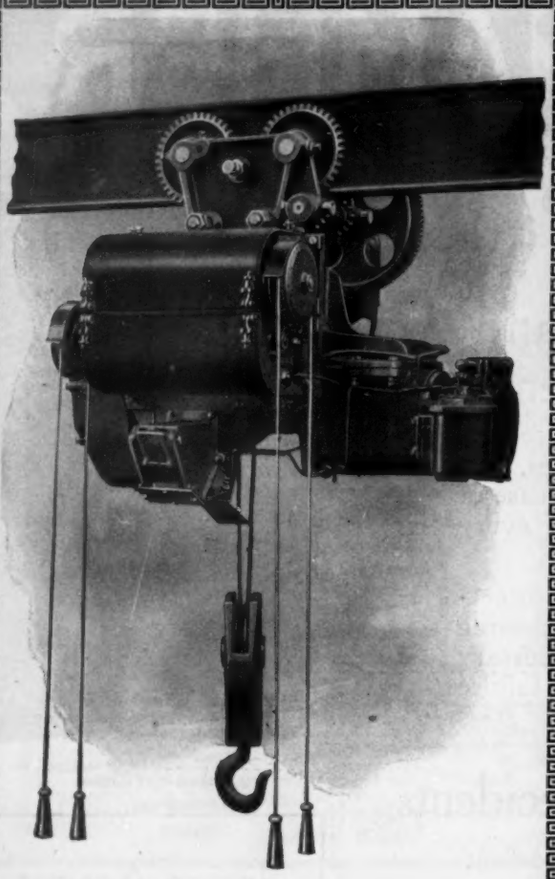
PHILADELPHIA: 1201 Chestnut Street CLEVELAND: Schofield Building CINCINNATI: Fourth Nat'l Bank Bldg.
PACIFIC COAST AGENTS: H. B. Squires Co., 979 Howard St., SAN FRANCISCO, 1026 Chamber of Commerce Bldg., PORTLAND and W. B. Palmer, 416 East 3rd Street, LOS ANGELES.



Why worry about Production Costs?

The cost of labor forms one of the chief items and you can reduce it with a

Type "U" Hoist

Instead of making from 6 to 10 men cart a heavy casting to a tool, why not let *one* man do it with a hoist.

You can arrange the runways so they will reach every important tool.

Let one man instead of 10 do the work.

Ask for Bulletin 301.

Pawling & Harnischfeger Co.
Milwaukee, Wisconsin

Industrial Works Cranes

Give the Most Service for the Cost

Because they are the most Durable, Adaptable and Efficient

They can be used with a bucket, lifting magnet, bottom block and hook, or may be used as a pile-driver and for switching cars.

Industrial Works Locomotive Cranes

are extremely simple in construction and easy in operation. They are the development of many years of practical experience. ***Write us today for our Catalog.*** It shows all styles of our cranes performing their various duties under actual conditions.

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Manufacturers of Wrecking and Locomotive Cranes from 5 to 150 tons capacity. Freight Station Cranes. Pile Drivers. Transfer Tables. Rail Sawing Machinery. Grab Buckets. Lifting Magnets.

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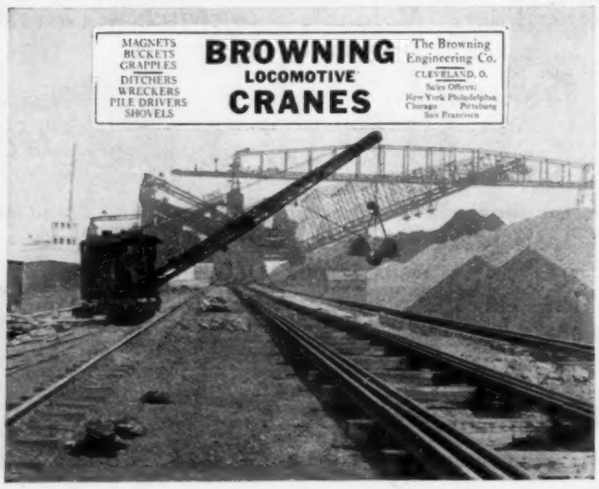
The McMyler Interstate Co.

New York CLEVELAND, O. Chicago

Locomotive Cranes
with Magnets, Buckets or Hook Blocks

20-ton Crane with Magnet. Northern Pacific Railroad, Seattle, Wash.



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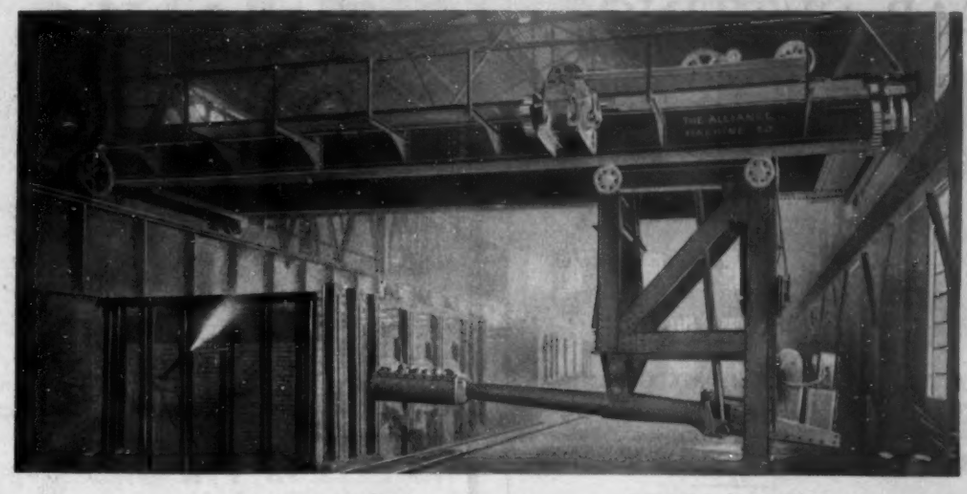

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Our standard design of open hearth charging machine built to operate on runways in an open hearth building. A simple machine of all-steel construction and well adapted for SEVERE SERVICE. Can be arranged to work in buildings not specially designed to accommodate charging machines.

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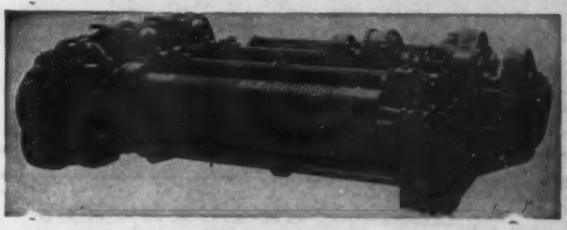

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For Machine Shops, Foundries, Railway Repair Shops, Shipyards, Lumber and Stone Yards

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All sizes SPUR, BEVEL, HERRINGBONE and DOUBLE HELICAL GEARS accurately planed.

Send us your inquiries.

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ANYTHING IN GEARS OR GEAR CUTTING. Accurate Work---Lowest Prices---Quick Deliveries.
We assure you a big saving of **time** and **money**. We specialize Spur and Worm Speed Reducers.
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for motor and other high speed drives.
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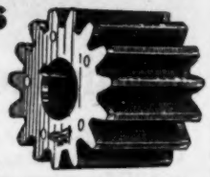

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Gearing is our specialty. A competent force of engineers always at your service. Send on your specifications.
V. D. & D. Gears and Pinions have established a reputation for accuracy and dependability.

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to 24 feet diameter, including cut herringbone gears with teeth cut from solid blanks.
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STEAM AND ELECTRICALLY OPERATED
Built in all sizes, for all conditions

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99% Efficiency
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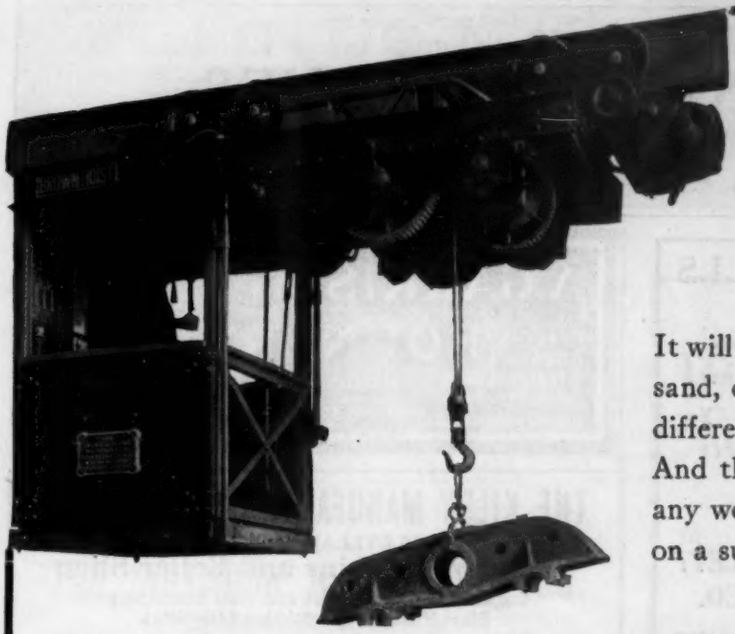

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will do for your plant.

It will transport your castings, flasks, scrap, sand, coke, and pig iron to and from the different parts of the buildings and yard. And this is done without interfering with any work on the floor, as the trolley travels on a suspended I-beam.

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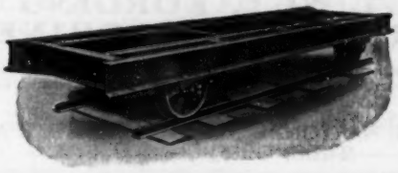

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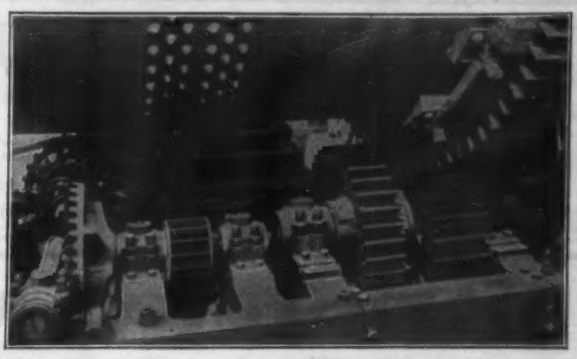

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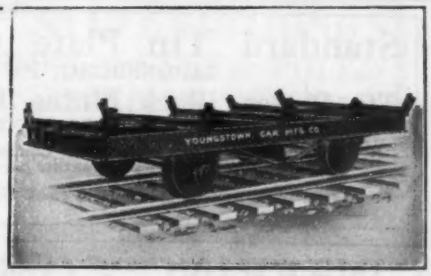

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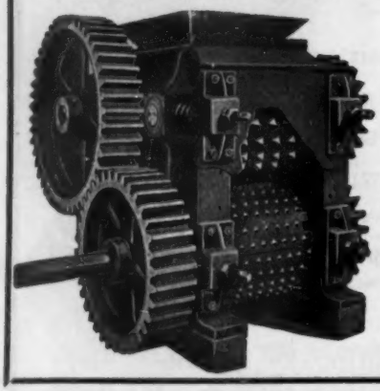

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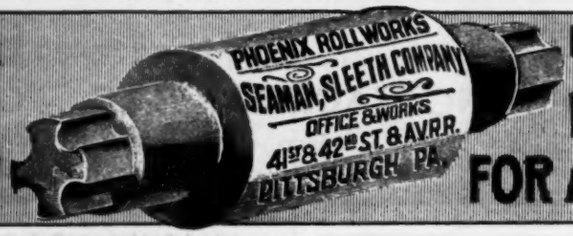

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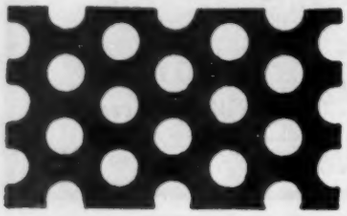
Also Tin Plates of Our Usual Good Quality



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TOOL STEEL---DRILL STEEL
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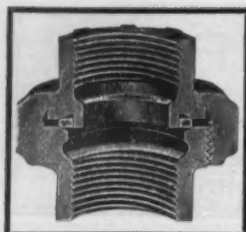

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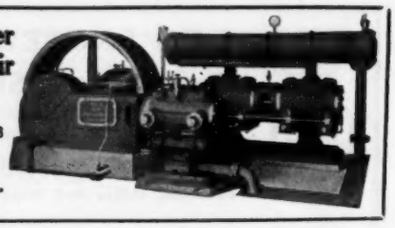

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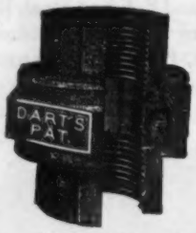

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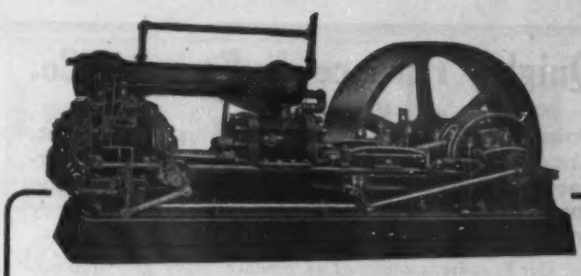

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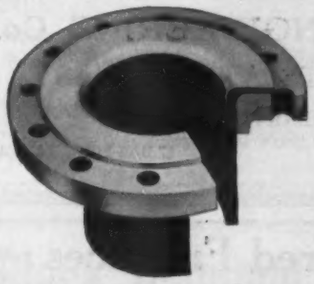

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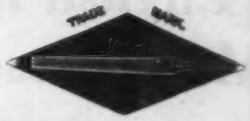

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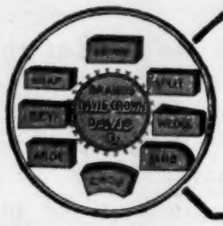
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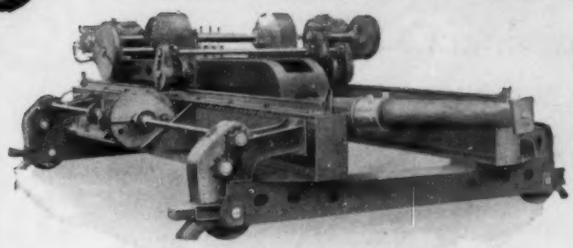

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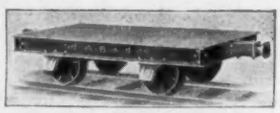
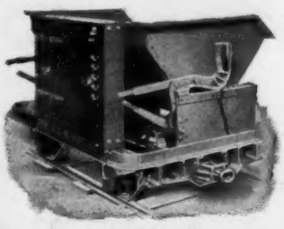


No. 288. All Steel Mill Car



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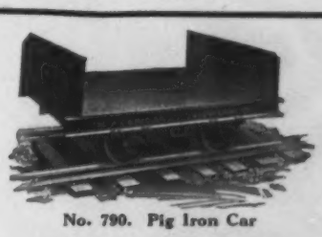
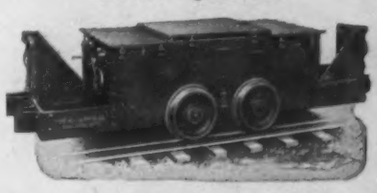


No. 790. Pig Iron Car



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